

**MASSACHUSETTS COASTAL BASIN
PEABODY, MASSACHUSETTS**

**FOUNTAIN POND DAM
MA 00191**

**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

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**DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154**

OCTOBER 1979

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Massachusetts Coastal Basin Peabody, Mass.		
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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

FEB 14 1980

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Fountain Pond Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Mr. Allen Taubert, Peabody Public Services Department, Berry Street, Peabody, Massachusetts 01960.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely,


MAX B. SCHEIDER

Colonel, Corps of Engineers
Division Engineer

Incl
As stated

FOUNTAIN POND DAM

MA 00191

MASSACHUSETTS COASTAL BASIN
PEABODY, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION
PROGRAM

NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA 00191

Name of Dam: Fountain Pond

Town: Peabody

County and State: Essex County, Massachusetts

Stream: Tapley Brook

Date of Inspection: April 18, 1979

(The impounding structure at Fountain Pond is a)
400-foot long, 16-foot high earth dam with a stone masonry wall on the downstream slope and an outlet conduit. There is no record of when the dam was built, although it is at least 75 years old. The pond is part of the water supply system for the City of Peabody. The crest of the dam varies from elevation (El) 72.0 to 69.8 and an unpaved road is on the crest of the dam. A granite block box conduit, centrally located in the dam, serves as the spillway. The width of the conduit opening is 4.0 feet and the height is 3.8 feet. Stoplogs are mounted at the entrance to the conduit. The crest of the stop logs is at El 68.3 and the invert of the conduit is at El 65.5. Water discharges into a 24-foot long discharge channel lined with granite blocks and then empties into a swamp downstream of the dam. The outlet conduit is a gated 24-inch diameter vitreous clay pipe with an invert at El 57. The conduit leads to a pumping station which pumps water into the distribution system.

There are deficiencies which must be corrected to assure the continued performance of this dam. This conclusion is based on the visual inspection of the site, a review of available data, and a review of operating and maintenance procedures. (Generally, the dam is in poor condition.)

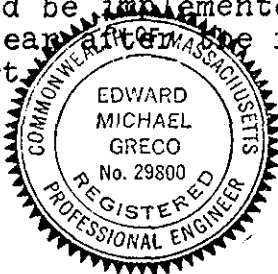
FOUNTAIN POND DAM

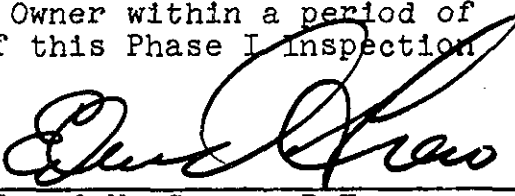
The following deficiencies were observed at the dam: erosion and missing riprap on the upstream slope, brush on the upstream slope; water running along the toe of the downstream slope; trees, brush and debris on the downstream slope; mortar missing between the spillway blocks; debris in both the upstream and downstream spillway channel; and a low area located on the eastern abutment of the dam.

Based on Corps of Engineers' guidelines, the dam has been classified in the "small" size and in the "significant" hazard categories.) The drainage area is 1.57 square miles. A test flood equal to a 100-year storm was used to evaluate the capacity of the spillway. The peak test flood inflow was estimated to be 407 cubic feet per second (cfs). The peak test flood outflow of 190 cfs with the pond at El 70.9 will overtop the low spot at the east abutment of the dam by a maximum of 1.1 feet and will overtop the dam by a maximum of 0.3 feet. One-half the probable maximum flood would produce a peak outflow of 1001 cfs and result in the pond at El 71.8. The spillway (with stoplogs) can discharge 26 cfs, which is 13.7 percent of the test flood outflow before the low spot is overtopped. Without stoplogs, the spillway can discharge 92 cfs or 48.4 percent of the test flood before the low spot is overtopped.


It is recommended that the Owner employ the services of a qualified engineering consultant to conduct a detailed hydraulic/hydrologic study to evaluate the capacity of the spillway and the potential for overtopping. In addition, the Owner should repair the deficiencies listed above, as described in Section 7.3. Also, the Owner should institute programs of technical inspection, surveillance, and a warning system for the dam.

The measures outlined above and in Section 7 should be implemented by the Owner within a period of one year after the receipt of this Phase I Inspection Report.




Edward M. Greco, P.E.
Project Manager
Metcalf & Eddy, Inc.
Massachusetts Registration
No. 29800

Approved by:

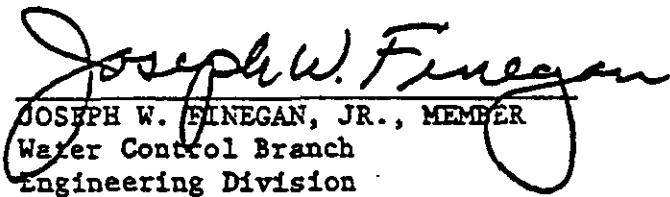

Stephen L. Bishop, P.E.
Vice President
Metcalf & Eddy, Inc.

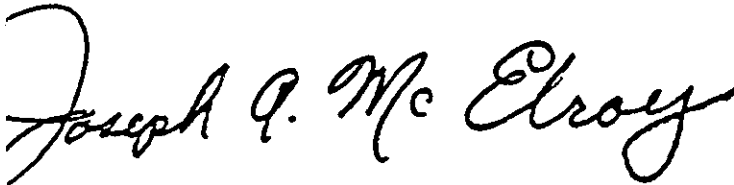
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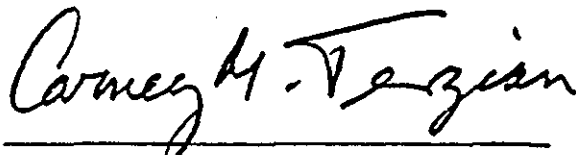
FOUNTAIN POND DAM

This Phase I Inspection Report on Fountain Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.


JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division



JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division



CARNEY M. TERZIAN, CHAIRMAN
Chief, Structural Section
Design Branch
Engineering Division

APPROVAL RECOMMENDED:


JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general conditions and the downstream damage potential.

FOUNTAIN POND DAM

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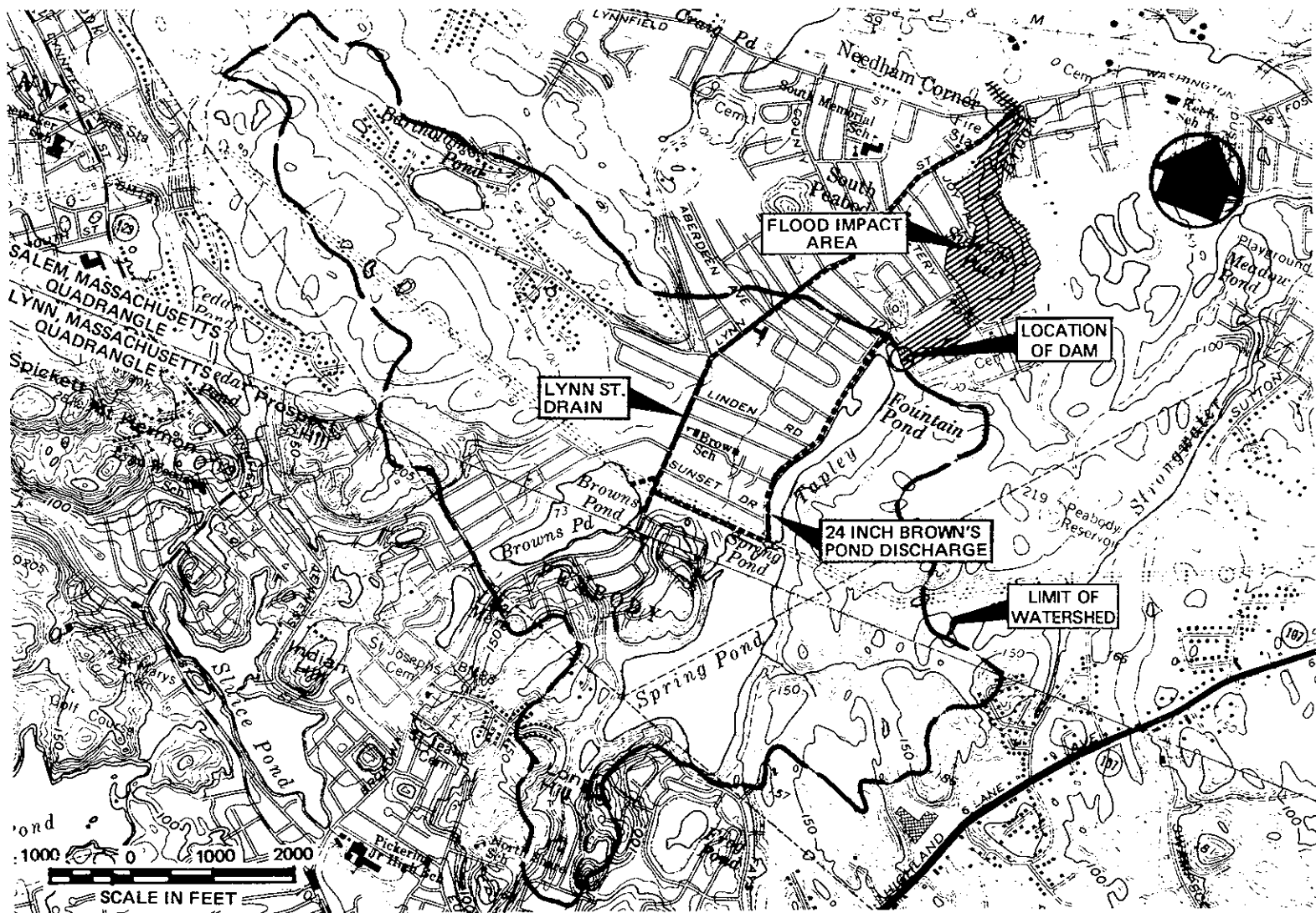
APPENDIX D - HYDROLOGIC AND HYDRAULIC
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 NATIONAL INVENTORY OF DAMS

FOUNTAIN POND DAM

**OVERVIEW
FOUNTAIN POND DAM
PEABODY, MASSACHUSETTS**





LOCATION MAP - FOUNTAIN POND

NATIONAL DAM INSPECTION
PROGRAM

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FOUNTAIN POND DAM

SECTION 1

PROJECT INFORMATION

1.1 General

- a. Authority. Public Law 92-367, dated August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Metcalf & Eddy, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Contract No. DACW 33-79-C-0054, dated March 27, 1979, has been assigned by the Corps of Engineers for this work.
- b. Purpose:
 - (1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
 - (2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.
 - (3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

- a. Location. The dam is located on Tapley Brook, a tributary of the North River (see Location
FOUNTAIN POND DAM

Map) and lies entirely within the City of Peabody, Essex County, Massachusetts. The coordinates of this location are latitude 42 deg. 30.5 min. north and longitude 70 deg. 56.6 min. west.

- b. Description of Dam and Appurtenances. The impounding structure at Fountain Pond Dam consists of the dam and an outlet conduit (see Figures B-1 through B-2 and photographs in Appendix A).

The dam is a 400-foot long earth embankment. The maximum height is about 16 feet, using contours of the original streambed shown in Figure B-3. According to the drawings for the dam, the embankment contains a mortared granite cutoff wall extending to an unknown depth below the base of the embankment (see Figure B-4). The crest of the dam is 10 to 15 feet wide and varies from El 72.0 to 69.8. An unpaved road is located on the crest. The upstream face slopes at 2.5:1 (horizontal to vertical) and is covered with riprap. The downstream face slopes at 2:1 and is covered with grass, brush, and trees. In many areas, debris has been dumped on the downstream slope.

Discharge from the pond is through a stone box conduit 3.8 feet high and 4 feet wide. This culvert serves as the spillway.

The approach to the spillway has vertical, granite sidewalls extending 9 feet upstream. Wooden stoplogs, which function as a weir, are set at the entrance to the conduit. The top of the stoplogs is at El 68.3, and the invert at the entrance to the conduit is at El 65.5. Downstream of the stoplogs, the floor of the conduit drops in three steps to El 60.1.

The discharge channel below the spillway is about 24 feet long and 4 feet wide. The side walls are constructed of granite blocks. The floor of the discharge channel is earth which has been eroded to an uneven surface.

- c. Size Classification. Fountain Pond Dam is classified in the "small" category since it has a maximum height of 16 feet and a maximum storage capacity of 115 acre-feet.

FOUNTAIN POND DAM

- d. Hazard Classification. The valley downstream of the dam varies from 400 to 1,100 feet wide. Sidneys Pond is formed by a dam which is located about 2,600 feet downstream of Fountain Pond Dam.

A cemetery and residential development occur downstream of the dam along both sides of the brook (see Location Map). Most of the homes are built away from and at least 10 feet above the bed of Tapley Brook. However, two homes are lower and closer to the stream, one where Cemetery Road crosses Tapley Brook and the other where Lynn Street crosses Tapley Brook. Below Lynn Street, Tapley Brook flows into a swamp that is bordered by a few residences.

If the dam failed with the pond at El 69.8 (low point at east abutment), the flood would produce a wave about 5 feet high 1,000 feet downstream. It is likely that this flood could result in property damage and the loss of a few lives. Discharge below Sydneys Pond Dam could also affect the roadway and one structure further downstream. Accordingly, the dam has been placed in the "significant" hazard category.

- e. Ownership. The dam has been owned since it was constructed by the Peabody Water Department. The current City Engineer is Mr. Allen Taubert at the Peabody Public Services Department, Berry Street, Peabody, Massachusetts 01960 (telephone 617-531-5135). Mr. Taubert granted permission to enter the property and inspect the dam.
- f. Operators. The dam is operated by the Peabody Water Department.
- g. Purpose of Dam. Water is stored in the reservoir for use as water supply for the City of Peabody. Water can be released upstream from Spring Pond Reservoir to Fountain Pond. Water from Fountain Pond is pumped to the water treatment plant. Water can also flow downstream to Sidneys Pond.
- h. Design and Construction History. There are no construction drawings for Fountain Pond Dam,
FOUNTAIN POND DAM

and the date of construction is not known. The first available inspection report, dated 1912, contains two sketches of cross-sections of the dam, one of which shows a stone masonry retaining wall (see Figure B-5). A cross-section through the dam is also shown on a 1932 drawing (see Figure B-4). Periodic reports through 1968 indicated generally good condition of the embankments, masonry wall and spillway.

It is apparent that the present Fountain Pond Dam was built to replace an older existing dam located 200 feet upstream. This dam, noted on Figure B-1 as "abandoned dam", was almost completely under water at the time of the field inspection. This older dam was constructed in much the same way as the present dam; that is, earth fill placed against a masonry wall and a centrally located spillway. The upstream face on the older dam was partially retained by a line of wooden sheeting.

In 1902 a pumping station was built on the west abutment of Fountain Pond Dam for the purpose of supplying water to the treatment plant and city water system. At a later date, an electrical substation was constructed adjacent to the pumping station.

In 1923 an excavation was made on the eastern abutment of the dam which created a low spot. This low spot will allow water to flow around the dam and through the cemetery during periods of high runoff.

1. Normal Operating Procedures. Personnel from the Peabody Water Department reportedly visit the dam daily. Also, there is someone on duty at the pumping house 24 hours a day. Normal procedures at the dam consist of regulating the stoplogs in the spillway at Fountain Pond. Discharge into Fountain Pond is regulated by operating stoplogs at Spring Pond and a valve at Suntaug Pond. Flood control reportedly consists of drawing the pond down by removing the stoplogs.

FOUNTAIN POND DAM

It is reported that the pumping station has been used to lower the water level in the pond for construction and maintenance purposes.

1.3 Pertinent Data

- a. Drainage Area. The approximately 1,005-acre (1.57-square mile) drainage area includes the drainage areas of Bartholomew Pond, Browns Pond and Tapley Brook which flows into Fountain Pond from Spring Pond to the south. The topography is hilly. About 10 percent of the drainage area is ponds and swamps. The remaining land is about half wooded. The cleared land has been mostly developed for residential use, especially surrounding Bartholomew Pond and west of Fountain Pond.
- b. Discharge. Normal discharge is through a stone box conduit 3.8 feet high by 4 feet wide which serves as a spillway. Stoplogs are set at the entrance to the conduit and function as a weir. The top of the stoplogs is at El 68.3. The discharge channel is about 4 feet wide and 24 feet long and discharges into Tapley Brook downstream of the toe of the dam. The valley below the dam is swampy in places. The valley varies in width from 400 to 1,100 feet. A dam forming Sidneys Pond is located about 2,600 feet downstream of Fountain Pond Dam.

A 24-inch pipe serves as an intake to the pumping station which pumps water to a distribution system. This flow can be shut off by a gate valve located in the pumping station.

Hydraulic analyses indicate that the stone box conduit (with stoplogs) can discharge an estimated 26 cfs with the pond at El 69.8, which is the elevation of the low spot on the east abutment. The peak test flood outflow (100-year storm) is estimated to be 190 cfs with the pond at El 70.9. During the test flood, the dam would be overtopped by a maximum of 0.3 feet. The low spot at the east abutment of the dam would be overtopped by a maximum of 1.1 feet. Water crossing the low spot would flow through the cemetery to Tapley

FOUNTAIN POND DAM

Brook. One-half the probable maximum flood would produce a peak outflow of 1001 cfs and result in the pond at El 71.8. This would overtop the dam by 1.2 feet and overtop the low area by 2.0 feet.

The spillway without stoplogs can discharge 92 cfs or 48.4 percent of the test flood before the low spot is overtopped. With the stoplogs in place, the spillway can discharge 26 cfs or 13.7 percent of the test flood before the low spot is overtopped.

c. Elevation (feet above Mean Sea Level (MSL)).

A monel spike was located on the northerly upstream wing wall of the outlet and served as a benchmark. The elevation was assumed to be 70.4 feet based on existing plans (see Figure B-4).

- (1) Top dam - 69.8 to 72.0
- (2) Test flood pool - 70.9
- (3) Design surcharge (original design) - unknown
- (4) Full flood control pool: Not Applicable (N/I)
- (5) Maximum operating pool: 68.3 - top of stoplogs
- (6) Spillway crest (without stoplogs): 65.5
(with stoplogs): 68.3
- (7) Upstream portal invert diversion tunnel: N/I
- (8) Streambed at centerline of dam: 55 (see Figure B-3)
- (9) Tailwater: 59.5 - swamp below dam

d. Reservoir

- (1) Length of normal pool: 3,040 feet
- (2) Length of maximum operating pool: 3,040 feet

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(3) Length of flood control pool: N/A

e. Storage (acre-feet)

(1) Test flood surcharge (net): 38 at El 70.9

(2) Top of dam (El 69.8, low point on dam): 115

(3) Flood control pool: N/A

(4) Maximum operating pool (El 68.3, top of stoplogs): 93

(5) Spillway crest (El 65.6): 52

f. Reservoir Surface (acres)

*(1) Top damP 14.7

*(2) Test flood pool: 14.7

(3) Flood control pool: N/A

(4) Maximum operating pool: 14.7

(5) Spillway crest: 14.7

g. Dam

(1) Type: earthfill embankment, mortared granite downstream wall, unpaved crest

(2) Length: 400 feet

(3) Height: (maximum) 16 feet

(4) Top width: 10 to 15 feet

(5) Side slopes: downstream 2:1, upstream 2.5:1

(6) Zoning: Earth fill with downstream wall of mortared granite

(7) Impervious core: Unknown

*Based on the assumption that the surface area will not significantly increase with changes in pond elevation from 65.5 to 69.8.

FOUNTAIN POND DAM

(8) Cutoff: Mortared granite downstream wall extends below embankment to an unknown depth

(9) Grout curtain: None

h. Spillway

(1) Type: Stone box culvert with stoplogs mounted at upstream end

(2) Crest length: 4.0 feet

(3) Crest elevation: 65.5 (without stoplogs)
68.3 (top of stoplogs)

(4) Gates: None

(5) Upstream channel: Vertical granite side walls extending 9 feet upstream, floor covered with debris

(6) Downstream channel: 4 feet wide, 24 feet long; vertical granite sidewalls; floor covered with earth and debris

i. Regulating Outlets The regulating outlets at the dam consists of a 24-inch diameter, vitreous clay pipe extending from the reservoir to the wet well in the pumping station. The invert of the conduit at the reservoir end is at approximately El 57. Flow is controlled by a gate valve in the pumping station which is operated several times a year. Discharge from the pumping station is into the city water distribution system.

FOUNTAIN POND DAM

SECTION 2

ENGINEERING DATA

- 2.1 General. Several drawings and previous inspection records are available for Fountain Pond Dam. A drawing (Figure B-3) dated 1902 shows the relationship of the old dam to the new dam and the site grading that was done prior to construction of the pumping house. This drawing was obtained from the Peabody Water Department. Another drawing a generalized section through the dam and a section through the spillway, dated 1932-1933 was obtained from the Essex County Engineer's Office (Figure B-4). Previous inspection notes (see Figures B-5 through B-11) were obtained from the Essex County Engineer's Office.

No other plans, specifications or computations are available from the Owner, County or State agencies relative to the design, construction or repair of this dam.

We acknowledge the assistance and cooperation of personnel from the Massachusetts Division of Waterways, the Essex County Engineer's Office; Mr. Allen Taubert, City Engineer of the City of Peabody, and Mr. Peter Smyrnios of the Peabody Water Department.

- 2.2 Construction Records. The only construction records are the drawings referred to in Section 2.1 and included in Appendix B. There are no as-built drawings for the dam or appurtenant structures.
- 2.3 Operating Records. No operating records are available; however, a daily record is kept of the elevation of the pool and of flow from the reservoir into the pumping station.

2.4 Evaluation

- a. Availability. There is limited engineering data available for this dam.
- b. Adequacy. The lack of detailed structural data did not allow for a definitive review. Therefore, the evaluation of the adequacy of

FOUNTAIN POND DAM

this dam is based on the review of available drawings, review of past inspection reports, visual inspection, past performance history, and engineering judgment.

- c. Validity. Comparison of the available drawings with the field survey conducted during the Phase I inspection indicates that the available information is valid. Although few elevations are given on the drawings, those listed compare favorably with the elevations obtained during the Phase I inspection.

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SECTION 3
VISUAL INSPECTION

3.1 Findings

- a. General. The Phase I Inspection of the dam at Fountain Pond was performed on April 18, 1979. A copy of the inspection checklist is included in Appendix A. Previous inspection reports were conducted by the Essex County Engineers in 1912, 1917, 1923 and on a biannual basis between 1928 and 1968. These inspection reports are given in Appendix B (see Pages B-5 through B-11).
- b. Dam. The dam is in poor condition. The most obvious deficiency is that trees, brush, and debris are covering the downstream slope of the dam (see photograph No. 7). Also, water from the Browns Pond bypass is discharging at the west end of the downstream toe of the dam and into Tapley Brook. Some erosion from foot traffic has occurred adjacent to the downstream wing walls of the spillway.

The upstream slope of the dam is generally covered with riprap, however, there are several areas where the riprap is missing. Many small bushes are growing on the upstream slope. These have been cut back in the past but not removed (see photographs No. 4 and No. 5). There is evidence of trespassing on most of the upstream slope.

The crest of the dam is an unpaved road. The surface contains minor ruts.

- c. Appurtenant Structures. Discharge from the pond is through a stone box conduit 3.8 feet high and 4 feet wide. This conduit serves as the spillway. Stoplogs are set at the entrance to the conduit and function as a weir (see Photographs C-2 and C-3). The stoplogs appear to be easily removable. They have been removed occasionally in the past, such as prior to a storm.

FOUNTAIN POND DAM

The mortar and chinking between the stone blocks has for the most part, been lost (see Photograph C-6) leaving large continuous voids between the blocks. Leaves, trash and other debris have accumulated against the stoplogs in the spillway. Water was leaking at about 3 to 4 gallons per minute around the stoplogs through one open joint on the left abutment.

There is an intake in the reservoir that furnishes water to the pumping station. The outlet to the pumping station is a 24-inch diameter pipe. A low-level outlet shown in Figure B-5 was not visible at the time of the inspection.

- d. Reservoir Area. The area around Fountain Pond contains a cemetery and sections of dense residential development. All of the residences are concentrated on the west side of the pond and along Tapley Brook down to Sydneys Pond. A new subdivision has been built on the east bank of Sydneys Pond. Land on the eastern side of Fountain Pond is wooded and slopes down to the reservoir at an 18 percent grade. The land is fairly level along the west bank and in areas downstream.
- e. Downstream Channel. The discharge channel below the spillway is lined with mortared granite blocks. The floor of the drainage channel was covered with soil and debris and it was not possible to determine if it was lined (see Photograph C-6). On the east side of the channel, there are small trees which could fall and partially block the channel (see Photograph C-7). Foot traffic has eroded soil from behind the west wall of the channel. Water discharges from the downstream channel into an area that is flat, swampy and overgrown with tall grass (see Photograph C-8).

- 3.2 Evaluation. The above findings indicate that the dam is in poor condition and that there are several deficiencies which require attention. It is evident that the dam is not adequately maintained. Recommended measures to improve these conditions are stated in Section 7.3.

FOUNTAIN POND DAM

SECTION 4

OPERATING PROCEDURES

4.1 Procedures. Personnel from the Peabody Water Department reportedly visit the dam daily. Also, there is someone on duty at the pumping house 24 hours a day. Normal procedures at the dam consist of regulating the stoplogs in the spillway at Fountain Pond. Discharge into Fountain Pond is controlled by operating stoplogs at Spring Pond and a gated outlet at Suntaug Lake. Water flows from Spring Pond through a pipe and into a box conduit that discharges into Fountain Pond. The flow from Spring Pond is controlled by stoplogs in the box conduit. The difference in elevation between the two ponds is generally less than 4 feet. Flow from Suntaug Lake is controlled by a valve at Suntaug Lake, which is left open during much of the dry portion of the year. Fountain Pond represents 1 percent of Peabody's water supply, Spring Pond about 29 percent and Suntaug Lake about 45 percent. The remainder is made up in storage outside this watershed and not connected to the Fountain Pond pumping station. The pond can be drawn down by removing the stoplogs and, in times of excessive flow, by pumping water from the reservoir. The pumping station has been used to lower Fountain Pond for construction purposes.

4.2 Maintenance of Dam. Some maintenance of the dam has been conducted in the past. Trees and brush have been kept cleared from the vicinity of the pumping station. There is also evidence of clearing of trees and brush in other areas on both the upstream and downstream slopes of the dam. However, subsequent growth has occurred.

Present conditions at the dam indicate that it has not been adequately maintained. Erosion has occurred on the upstream slope of the dam, causing

FOUNTAIN POND DAM

the loss of some riprap and undermining of the remainder (see Photographs C-4 and C-5). Erosion on the downstream slope is undermining the left wing wall of the discharge channel. Trees and brush are growing on the upstream and downstream slope of the dam (see Photographs C-4 and C-7). Trash and other debris cover the downstream slope of the dam in many places. The mortar and chinking between the stonework in both the spillway and discharge channel is missing or is in very poor condition. Both the floor of the spillway and the floor of the discharge channel are covered with silt and debris such that their condition cannot be determined (see Photographs C-2 and C-6). There are several small trees overhanging the discharge channel.

- 4.3 Maintenance of Operating Facilities. The intake pipe to the pumping station is located in the northwest corner of the reservoir (see Figure B-3). Flow through the intake is controlled by a gate valve located inside the pumping station. This valve is left open. At the time of the April 1979 inspection, the intake was submerged and not accessible for inspection. The valve on the downstream end of the Suntaug Hake line was replaced in 1978.
- 4.4 Description of Any Warning System in Effect. There is no warning system in effect at this dam.
- 4.5 Evaluation. Although maintenance personnel visit the dam regularly, the maintenance program is not adequate. There is no regular program of technical inspection, a plan for surveillance of the embankment during and after periods of unusually heavy rainfall, or a warning system in effect at Fountain Pond Dam. This is undesirable considering the dam is in the "significant" hazard category. These programs should be implemented by the Owner, as recommended in Section 7.3.

FOUNTAIN POND DAM

SECTION 5

HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

- a. General. Fountain Pond is impounded by a 400-foot long, 16-foot high earth dam. A low area at the east abutment was found to be 1-foot below the crest of the dam. The drainage area for the pond is 1.57 square miles and is located in partly wooded and in partly suburban communities with sections of dense residential and light commercial development (see Location Map).

Browns Pond Dam and Spring Pond Dam are located in the drainage area of Fountain Pond Dam.

Under normal conditions, drainage into Fountain Pond consists of discharge from Spring Pond, discharge from Suntaug Lake, which is outside the drainage area, and surface runoff directly into Fountain Pond. Discharge from Browns Pond is normally diverted by a drain beneath Lynn Street. Excess discharge from Browns Pond is carried by a 24-inch pipe that terminates at the downstream toe of Fountain Pond Dam. The valley below Fountain Pond Dam is wide with one side occupied by a cemetery and the other by a swamp. Sidney's Pond Dam is located about 2,600 feet downstream and is surrounded by housing.

The maximum storage level in Fountain Pond is calculated to be 115 acre-feet. The maximum reported pond level was El 68.74 on May 12, 1977. There is no mention in City or County records of the dam being overtopped. The pond is used for water supply to the City of Peabody.

- b. Design Data. There are no hydraulic/hydrologic computations available for the design of the spillway at Fountain Pond Dam.

FOUNTAIN POND DAM

- c. Experience Data. Detailed hydraulic records are not available for this dam other than the daily water levels available from the Owner and these are limited to the last few years. There are no records available for the storms in 1938 and 1955. During the January 1979 storm, the recorded water level was El 62.58. The maximum recorded water level to date was El 68.74 which occurred on May 12, 1977. This was due to an excess amount of water released from Suntaug Lake, and was not the result of a storm. The Owner has stated that the dam has never been overtopped.
- d. Visual Observations. Water discharges over stoplogs at the downstream edge of the spillway. The spillway is a box conduit with an invert at El 65.5 and a weir length of 4.0 feet (see Figures B-1 and B-2). The discharge channel is 4 feet wide, 24 feet long and drops from the crest in three steps to a nearly flat floor. The sides of the channel are vertical granite mortared walls, 5 feet high at the spillway, and 11 feet high at the bottom of the steps (see Photograph C-6). The floor beyond the granite steps is covered with soil.

Leaves and soil have settled out upstream of the stoplogs on the spillway. Much of the mortar has been lost between the granite blocks. Debris and several small boulders were observed in the discharge channel. Trees are growing along the east side of the channel.

The outlet for the dam consists of a 24-inch pipe which is the intake for the pumping station. There is a gate valve located in the pumping station.

A more detailed discussion of the condition of the dam and appurtenances is given in Section 3, Visual Inspection.

FOUNTAIN POND DAM

- e. Test Flood Analysis. Fountain Pond Dam has been placed in the "small" size category and in the "significant" hazard category. According to the Corps of Engineers' guidelines, a spillway design flood ranging between a 100-year flood and a one-half PMF should be used to evaluate the capacity of the spillway. In the following analysis, a 100-year storm was used.

The test flood inflow for Fountain Pond Dam was determined using 100-year storm and one-half PMF outflows from Spring Pond and Brown's Pond given in other Phase I Inspection Reports. These outflows were added to direct inflow for Fountain Pond, and then 16 cfs was subtracted to account for discharge through the Lynn Street drain and the 24-inch drain that bypass Fountain Pond. The adjusted test flood inflow (100-year storm) was determined to be 407 cfs, including a 453 cfs outflow from Brown's Pond, 383 cfs from Spring Pond, and 168 cfs from direct runoff into Fountain Pond. The peak test flood outflow was determined to be 190 cfs with the pond at El 70.9. During the one-half probable maximum flood, the peak inflow would be 1004 cfs, resulting in a peak outflow of 1001 cfs with the pond at El 71.8.

Hydraulic analyses indicate that the spillway with stoplogs can discharge 26 cfs with the pond at El 69.8, which is the elevation of the low point on the east abutment. This discharge is 13.7 percent of the test flood outflow. Without stoplogs, the spillway can discharge 92 cfs or 48.4 percent of the test flood before the low point is overtopped.

During the test flood, the dam would be overtopped by a maximum of 0.3 feet and discharge over the crest would be 12.6 cfs. The depth at critical flow would be 0.18 feet, with a velocity of 2.4 feet per second. During the test flood, the low point at the east abutment of the dam would be overtopped by a maximum of 1.1 feet. Discharge through that area would be 107 cfs and would rejoin Tapley Brook downstream of the dam.

FOUNTAIN POND DAM

During a one-half PMF storm, the dam would be overtopped by 1.2 feet and the low area overtopped by 2.0 feet.

The pumping station can discharge a flow of 25 mgd into the system or to waste but this would not have a significant impact on the test flood.

- f. Dam Failure Analysis. The peak discharge rate due to failure of the dam was calculated to be 3,000 cfs, assuming a breach 60 feet wide and a head of 9.6 feet. The abandoned dam located upstream would mitigate the volume and rate of flooding caused by failure of Fountain Pond Dam. However, the abandoned dam would not diminish the initial flood wave released by failure.

Failure of Fountain Pond Dam would produce a flood wave approximately 4 to 5 feet above the foundation of one downstream house on Cemetery Road. Another home on the west bank of Tapley Brook, where it crosses under Lynn Street, may also sustain some flooding. It is also possible that the flood wave could damage or overtop the dam at Sydneys Pond. For these reasons, Fountain Pond Dam has been placed in the "significant" hazard category.

FOUNTAIN POND DAM

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

- a. Visual Observations. The evaluation of the structural stability of Fountain Pond Dam is based on a review of the available data, a review of previous inspection reports, and the visual inspection conducted on April 18, 1979.

As discussed in Section 3, Visual Inspection, the dam is in fair condition. There were no visible signs of vertical settlement at the dam, however, erosion of the slopes and growth of trees and brush are occurring.

- b. Design and Construction Data. The information listed in Section 2, Engineering Data, represents the available design data. There are no other plans, specifications or computations available on the design and construction of this dam from the Owner, County or State.

Information does not appear to exist on the type, shear strength and permeability of the soil and/or rock materials of the embankment.

- c. Operating Records. There is no evidence of instrumentation of any type in Fountain Pond Dam, and there is nothing to indicate that any instrumentation was ever installed at this dam. The performance of this dam under prior loading can only be inferred from physical evidence at the site.

- d. Post-Construction Changes. There are no as-built drawings available for Fountain Pond Dam. A steel grate protecting the spillway shown on the 1932 plan was described as being in "bad shape" in 1944 and was removed from the dam sometime after this. In 1902 the pumping station was constructed.

- e. Seismic Stability. Fountain Pond Dam is located in Seismic Zone No. 3, indicating that there is a potential for major damage due to
- FOUNTAIN POND DAM

earthquakes in this area. This classification is based on previous earthquakes in the area, principally the 1727 and 1755 earthquakes which reached intensity VIII (Modified Mercalli Scale) in the Cape Ann area. There is no record of any major earthquakes in this area since 1755.

Damage suffered by the dam during a seismic event would result from a combination of the duration and intensity of the earthquake, the type of foundation material, and the embankment properties of the dam. These data which are necessary for a seismic stability analysis are not available and until such data are acquired, the stability of the dam during an earthquake cannot be evaluated.

However, because of Fountain Pond Dam's configuration and the low head of water retained, a seismic stability analysis is not considered warranted at this time.

FOUNTAIN POND DAM

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

- a. Condition. Based upon a review of available data, the visual inspection of the site, and limited operating or maintenance information, there are deficiencies which must be corrected to assure the continued performance of the dam. Several signs of distress were observed: riprap failures on the upstream slope; brush on the upstream slope; trees, brush and debris on the downstream slope; water flowing across the toe of the downstream slope; mortar missing between the spillway blocks, debris in both the upstream and downstream spillway channel and the low area located on the eastern dam abutment.

A test flood inflow (100-year storm) of 407 cfs was used to evaluate the capacity of the spillway. The test flood outflow of 190 cfs results in the pond at El 70.9 and will overtop the dam by a maximum of 0.3 feet and the low area at the east abutment by a maximum of 1.1 feet. A one-half PMF would produce a peak outflow of 1001 cfs and result in the pond at El 71.8. This would overtop the dam by 1.2 feet and overtop the low area by 2.0 feet. The spillway (with stoplogs) can discharge 13.7 percent of the test flood before the low spot near the dam is overtopped. Without stoplogs, the spillway can discharge 92 cfs or 48.4 percent of the test flood before the low spot is overtopped.

- b. Adequacy. The lack of detailed design and construction data did not allow for a definitive review. Therefore, the evaluation of this dam is based on a review of the available data, the visual inspection, past performance and engineering judgment.
- c. Urgency. The recommendations and remedial measures outlined below should be implemented by the Owner within one year after receipt of this Phase I Inspection Report.

FOUNTAIN POND DAM

- d. Need for Additional Investigation Additional investigations to further assess the adequacy of the dam are outlined in Section 7.2, Recommendations.

7.2 Recommendations. In view of the concerns over the continued performance of the dam, it is recommended that the Owner employ a qualified engineering consultant to conduct a detailed hydrologic/hydraulic study to evaluate increasing the capacity of the spillway and the potential for overtopping. The Owner should implement the recommendations of the consultant.

7.3 Remedial Measures

- a. Operating and Maintenance Procedures. It is recommended that the Owner accomplish the following:

- (1) initiate a program of selective clearing of trees, brush and roots from both slopes of the dam and from the sides of the spillway discharge channel. All excavations resulting from removal of stumps and roots should be backfilled with selected materials;
- (2) divert the discharge from Browns Pond line away from the toe of the dam;
- (3) replace mortar between the stone blocks in the spillway;
- (4) repair erosion on the upstream slope of the dam, replacing any missing riprap;
- (5) remove all trash and debris from the downstream slope and discharge channel;
- (6) implement a systematic program of maintenance inspections. As a minimum, the inspection program should consist of a monthly inspection of the dam and appurtenances, supplemented by additional

FOUNTAIN POND DAM

inspections during and after severe storms. Maintenance should include clearing of debris from the spillway and discharge channel, clearing of trees, brush and debris from the slopes, and repair of erosion to slopes, or to the mortar in the spillway. All repairs should be undertaken in accordance with all applicable State regulations;

- (7) conduct periodic technical inspections of this dam on an annual basis;
- (8) institute a definite plan for surveillance of the embankment during and after periods of unusually heavy rains and/or runoff and a plan for notifying downstream residents in the event of an emergency at the project.

7.4 Alternatives. There are no recommended alternatives to the program outlined above.

FOUNTAIN POND DAM

APPENDIX A
PERIODIC INSPECTION
CHECKLIST

FOUNTAIN POND DAM

PERIODIC INSPECTION

PARTY ORGANIZATION

PROJECT FOUNTAIN POND DAM

DATE April 18, 1979

TIME 8:15 A.M.

WEATHER Partly Cloudy

W.S. ELEV. 67.4 U.S. 59.5 DN.S.

PARTY:

- | | |
|---------------------------|-------------------------|
| 1. <u>William Checchi</u> | 6. <u>Lyle Branagan</u> |
| 2. <u>Michael Gilbert</u> | 7. _____ |
| 3. <u>Michael Larson</u> | 8. _____ |
| 4. <u>Henry Lord</u> | 9. _____ |
| 5. <u>Scott Nagel</u> | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Dam Embankment</u>	<u>Larson/Nagel</u>	
2. <u>Spillway</u>	<u>Larson/Nagel</u>	
3. _____		
4. _____		
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

PERIODIC INSPECTION CHECK LIST

PROJECT FOUNTAIN POND DAM DATE April 18, 1979

PROJECT FEATURE Dam Embankment NAME Larson

DISCIPLINE Geotechnical NAME Nagel

U/S = Upstream Lt. = left

D/S = Downstream Rt. = right

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	
Crest Elevation	71+ ft.
Current Pool Elevation	67.4 ft.
Maximum Impoundment to Date	67.9 ft.
Surface Cracks	None
Pavement Condition	Dirt roadway on crest of dam- very little evidence of rutting
Movement or Settlement of Crest	None
Lateral Movement	None
Vertical Alignment	Good-relatively flat
Horizontal Alignment	Slight upstream bow
Condition at Abutment and at Concrete Structures	Rt. abutment lower than dam Lt. abutment has pumping and electrical station on it.
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	Everywhere but particularly on D/S face next to outlet channel
Sloughing or Erosion of Slopes or Abutments	Some localized erosion especially next to pump station where construction has removed the vegetative cover
Rock Slope Protection - Riprap Failures	Many failures and localized sloughing noted, particularly at the present water level
Unusual Movement or Cracking at or near Toes	D/S visibility limited-some evidence of muskrats burrowing into dam. 5 burrows on U/S slope below water level.
Unusual Embankment or Downstream Seepage	None visible-water from Browns' Pond overflow running along dam obscures any seepage at dam toe.
Piping or Boils	None visible
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

PERIODIC INSPECTION CHECK LIST

PROJECT FOUNTAIN POND DAM DATE April 18, 1979

PROJECT FEATURE Spillway at Dam NAME Larson

DISCIPLINE Geotechnical NAME Nagel

U/S = Upstream Rt. = right

D/S = Downstream Lt. = left

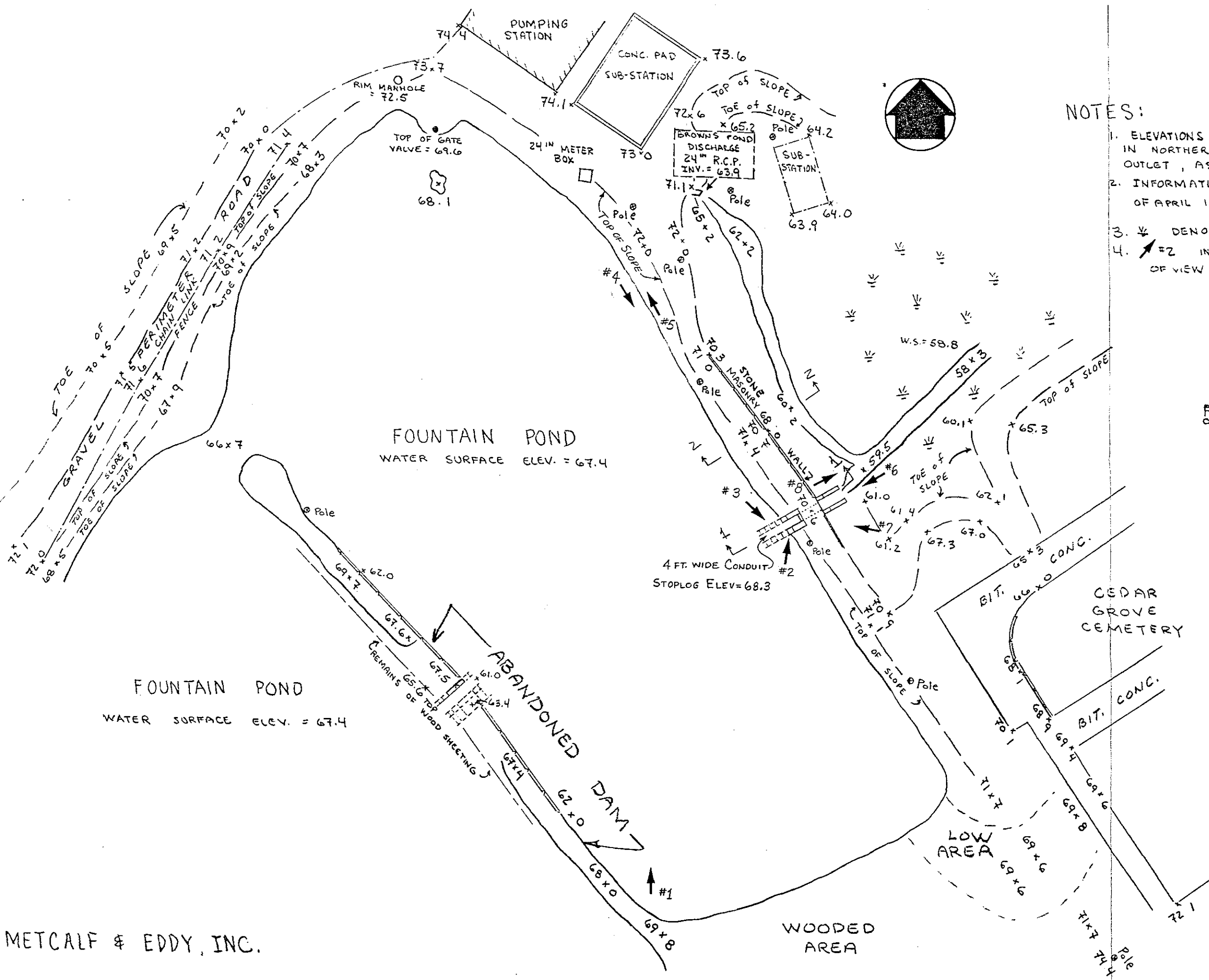
AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	Mortared and dry stone masonry- large granite blocks.
a. Approach Channel	
General Condition	Submerged - no visible obstructions bottom covered with leaves & debris
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Covered with leaves & debris limited visibility
b. Weir and Training Walls	Mortared & dry stone masonry- 2x6-inch stop logs with side slots in stone
General Condition of Concrete	Much of the mortar is missing
Rust or Staining	Slight staining on cascade steps none to very minor below the water level
Spalling	N/A
Any Visible Reinforcing	None
Any Seepage or Efflorescence	Seepage only around stop logs
Drain Holes	None visible
c. Discharge Channel	Mortared & dry stone masonry.
General Condition	Fair-voids between stones-with weeds growing-at bottom some erosion behind stones.
Loose Rock Overhanging Channel	Some dumped rock held back by saplings
Trees Overhanging Channel	Some saplings on Rt. abutment
Floor of Channel	Covered with debris and 2 small boulders
Other Obstructions	None

APPENDIX B

PLANS OF DAM AND PREVIOUS INSPECTION REPORTS

	<u>Page</u>
Figure B-1, Plan of Dam	B-1
Figure B-2, Sectons through Dam	B-2
Figure B-3, Plan of Pumping Station Lot showing Dam, Intake and Old Dam, dated 1902	B-3
Figure B-4, Plan of Reservoir and Dam with Cross Sections, dated 1932-33	B-4
Inspection Reports by Essex County Engineers, dated 1912 through 1968	B-5
Inspection Report by Massachusetts Department of Public Works, dated November 1971	B-11

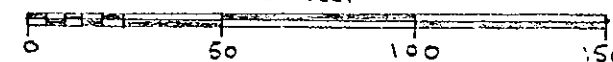
FOUNTAIN POND DAM



NOTES:

1. ELEVATIONS SHOWN BASED ON MONEL SPIKE IN NORTHERLY, UPSTREAM WINGWALL OF OUTLET, ASSUMED ELEV. = 70.4 (MSL).
2. INFORMATION SHOWN BASED ON FIELD SURVEY OF APRIL 18, 1979
3. ♪ DENOTES SWAMPY AREA
4. #2 INDICATES LOCATION AND DIRECTION OF VIEW FOR PHOTOGRAPHS

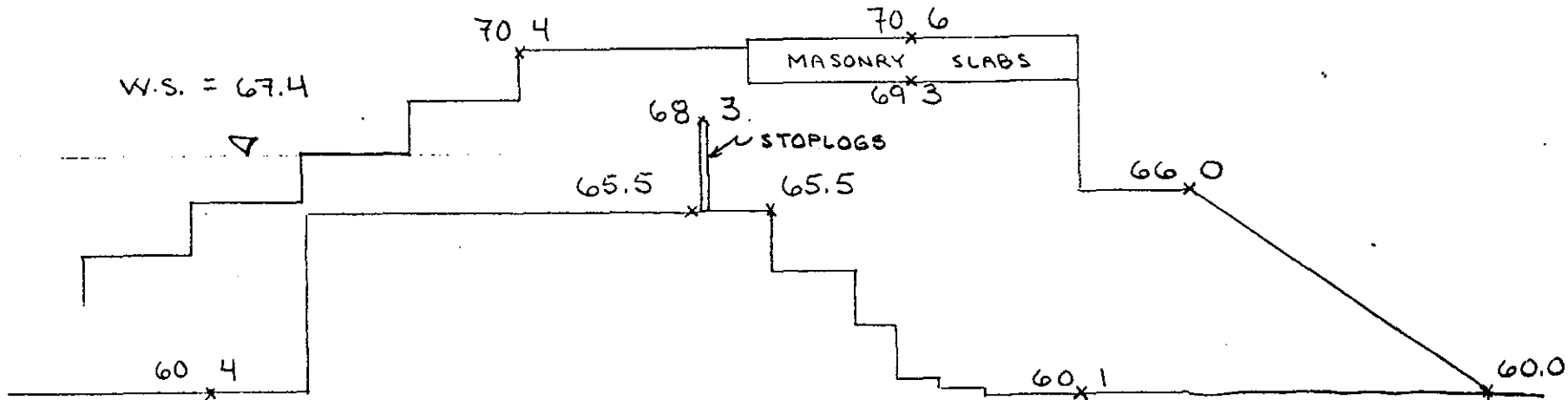
PLAN SCALE
in feet



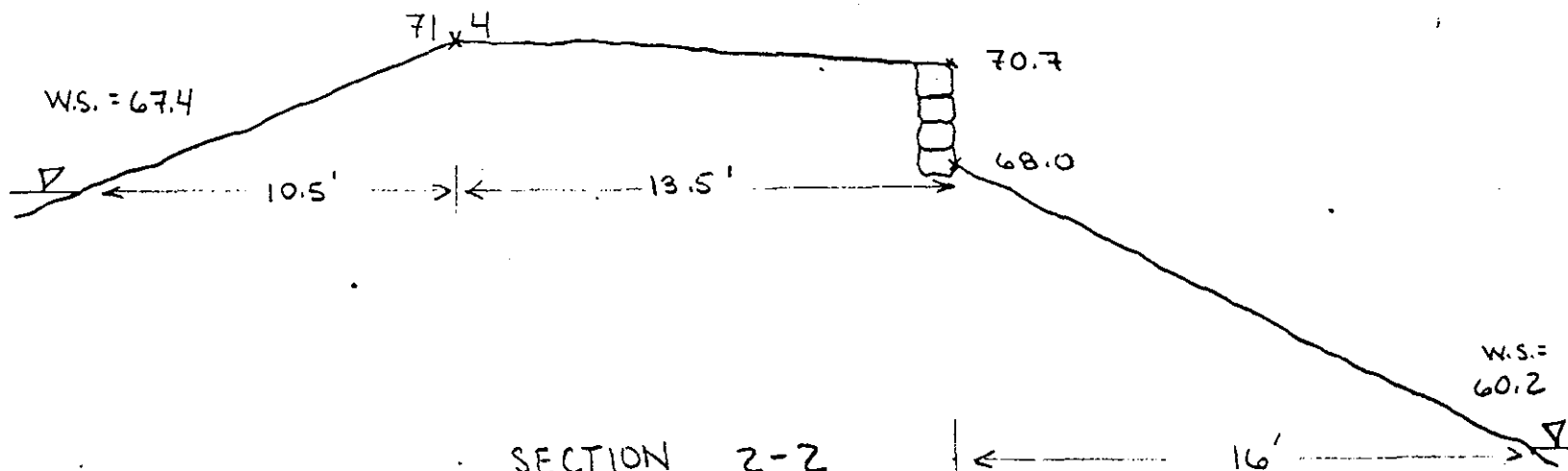
METCALF & EDDY, INC. ENGINEERS BOSTON, MA.	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MA.
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS	
FOUNTAIN POND DAM	
FIGURE B-1 PLAN OF DAM	
TRIBUTARY NORTH RIVER	MASSACHUSETTS
SCALE: 1" = 50'	DATE: MAY, 1979

METCALF & EDDY, INC.

ETCALF & EDDY, INC.

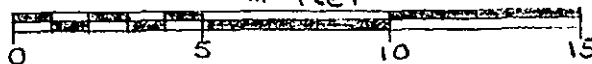


SECTION 1-1

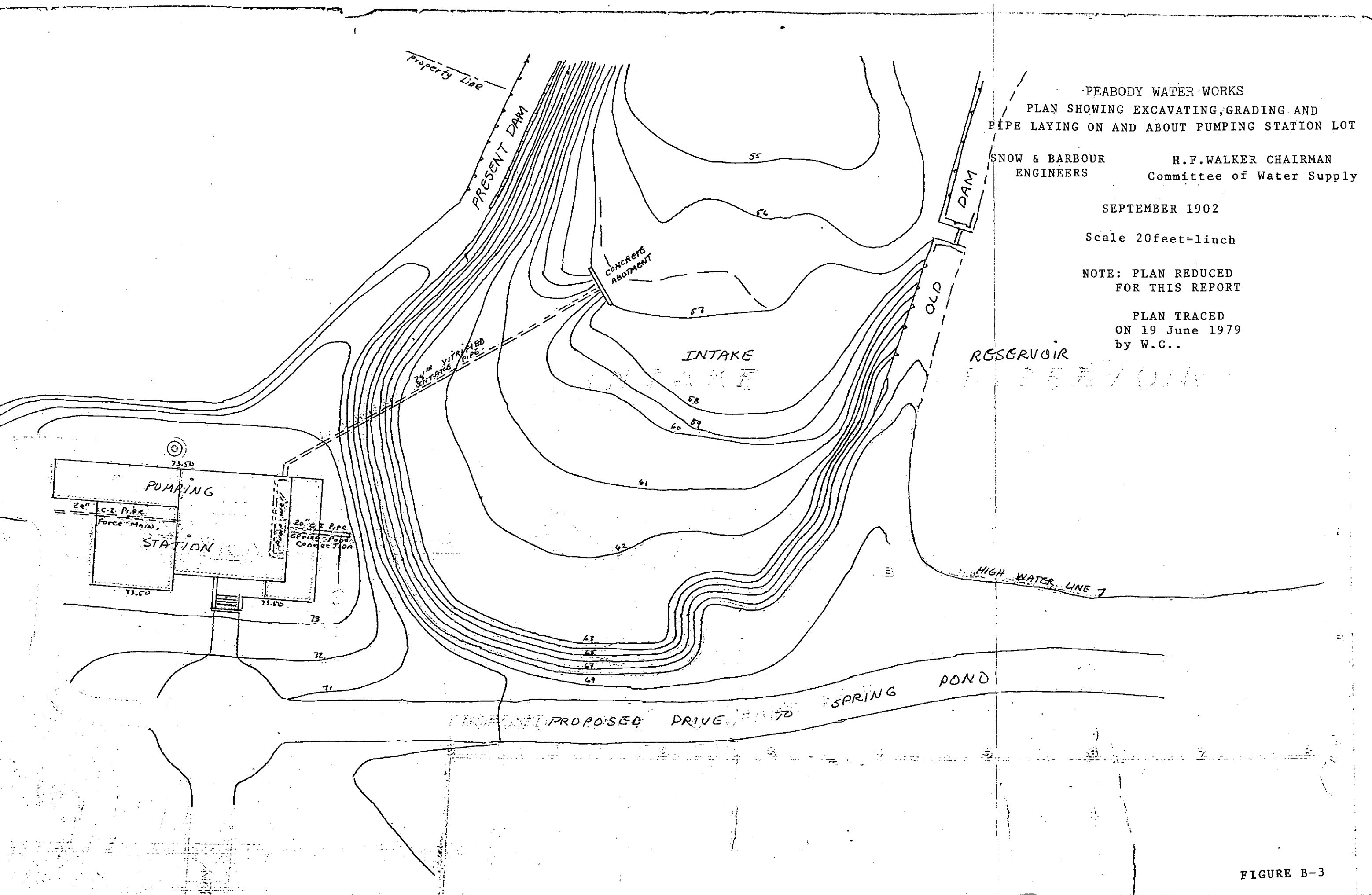


SECTION 2-2

SECTION SCALE
in feet



ETCALF & EDDY, INC.		U.S. ARMY ENGINEER DIVISION, NEW ENGLAND DISTRICT	
ENGINEERS		ENGINEERS	
BOSTON, MA.		WILMINGTON, MA.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
FOUNTAIN POND DAM			
FIGURE B-2 SECTIONS THROUGH DAM			
TRIUNYATTA RIVER		MASSACHUSETTS	
SCALE: 1" = 5'		DATE: MAY, 1978	



PEABODY WATER WORKS
PLAN SHOWING EXCAVATING, GRADING AND
PIPE LAYING ON AND ABOUT PUMPING STATION LOT
SNOW & BARBOUR ENGINEERS
H.F. WALKER CHAIRMAN
Committee of Water Supply

SEPTEMBER 1902

Scale 20 feet = 1 inch

NOTE: PLAN REDUCED
FOR THIS REPORT

PLAN TRACED
ON 19 June 1979
by W.C..

FIGURE B-3

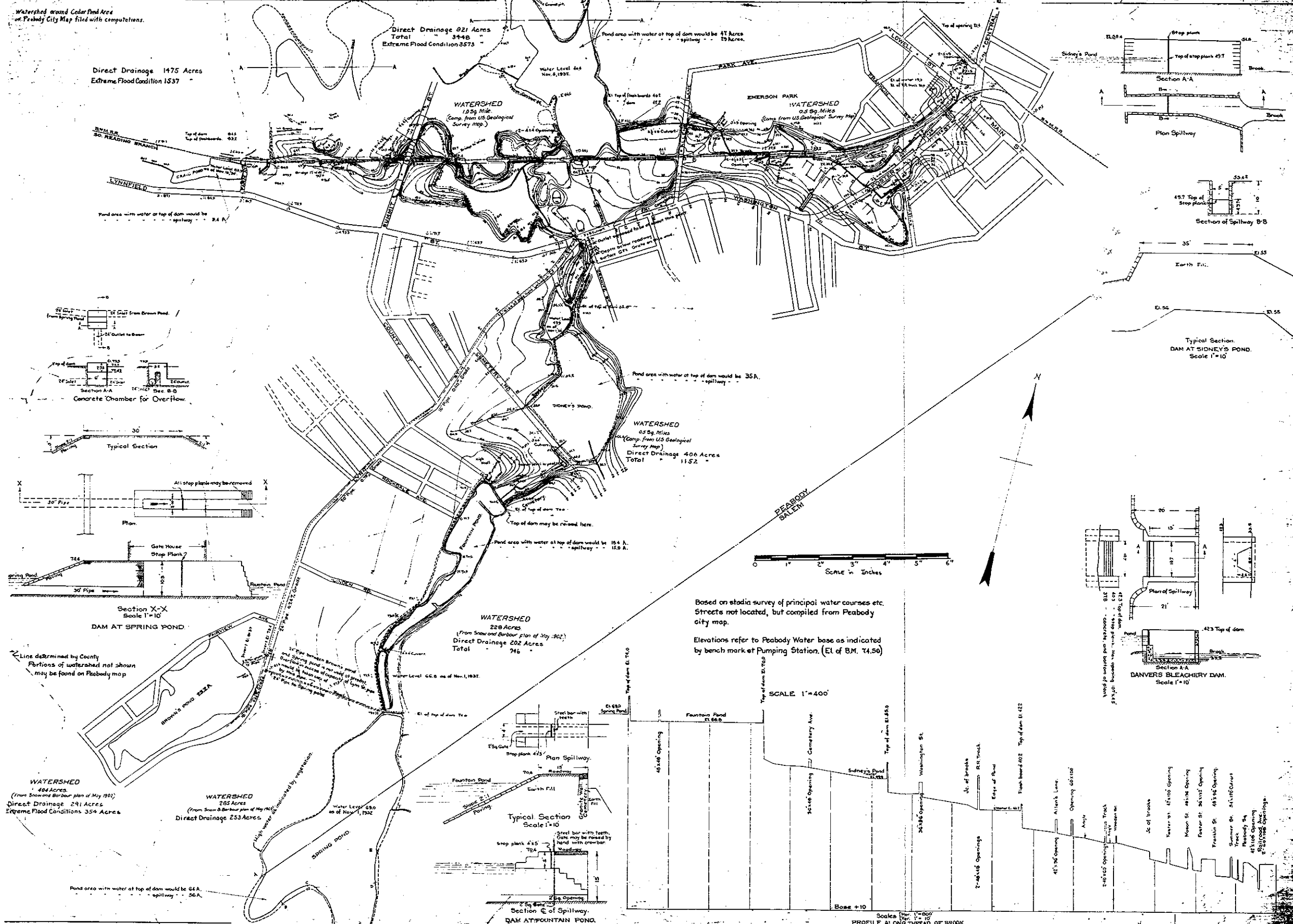


FIGURE B-4

COUNTY OF ESSEX, MASSACHUSETTS
ENGINEERING DEPARTMENT

Inspection of Dams, Reservoirs, and Stand Pipes

O 125-5

SUB NUMBER

D. 10 R. S. P.

Neg. Nos. 140

Inspector B. B. Barker Date April 9, 1912 *Classification 2

City or Town Peabody Location Mountain Pond (or the Basin)

Tapley Brook at the Peabody Pumping Station. W. R. P.

Owner Peabody Water Works Use Water Supply

Include such details as cores, cut off walls, paving, sodding, class of masonry, kind of cement, (nat. or port.) etc.

Material and Type Earth, with granite wall on lower side. Paving (large flat stones) on upper side. Dam forms a road

Elevations in feet: above (+) or below (-) full pond or reservoir level. (Cross out what does not apply.)

For Dam
Bed of stream below -15 Bottom of pond -15+ Bottom of spillway -5 Top of dam 0 Top of flash boards
For Res. or S. P.
Ground surface below Bottom of res. Level of over-flow pipe Top of res.

For dam
Length in ft. 200 Top width in ft. 15 Pond area 10.4 acres Area of watershed 201 acres 1.6 sq. mi.
For Res. or S. P.

Inside dimensions Capacity 26,000,000 covered

Length of overflow or spillway 178 Outlet pipes (size and nature) 24" drawoff

Stand pipe, thickness at base diam. of rivet head Pitch

Foundation and details of construction

Constructed by and date

Recent repairs and date

Evidence of leakage None

Condition Good S.P. when painted inside out

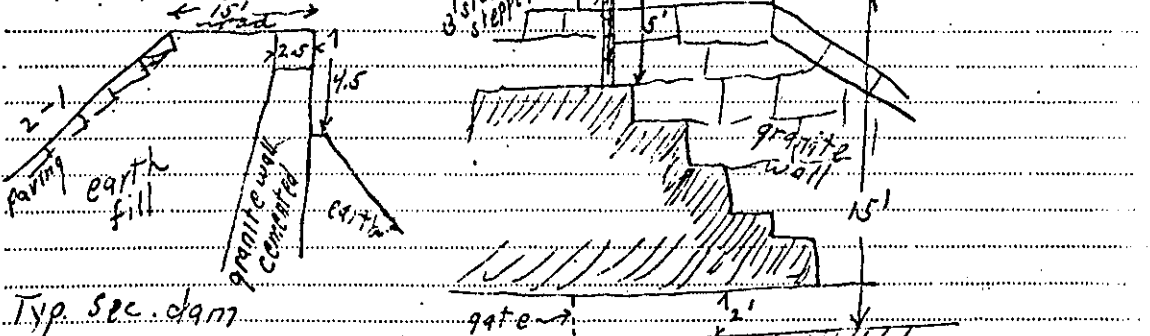
Topography of country below Large open wide valley

Nature, extent, proximity, etc. of buildings, roads or other property in danger if failure should occur Several houses at S. Lynn St. one mile below dam

Plans and data secured or available

Use separate sheet for sketches if necessary.

Notes, sketches, sections, etc.



gates No change 9.18.1916 A.E.

*Classify as to probable damage in case of failure. 1 slight. 2 moderate. 3 serious.

Peabody D. 10

1917, March 26. Watershed 0.3 sq. m. Max. Ht. 15.0 ft. Apparent condition, Good.

1923, Nov. 26. R. R. Evans, Insp. Peabody Water Works Dam at Pumping Station. The embankment and wall and the slope paving is in good condition. The gate on the outlet is not provided with operating mechanism but stop plank could be removed to give an opening 5 feet high and 4 feet wide. As at present fixed, these plank will hold at normal water level only about one foot below the roadway surface, and in the cemetery to the east belonging to the city earth is being excavated just beyond the dam which will apparently make a lower point than the crest and give an outlet to the water through the corner of the cemetery. This hole should be filled or stop plank lowered. They are too high in any case to properly provide for depth of over flow and wave action. Although being located beside the pumping station the supervision will probably be sufficient to forestall any trouble.

The area of watershed is by water supply report 806 acres and pond area 16.3 acres for this pond alone or 107.6 acres including Brown Pond and Spring Pond. With all stop plank removed the wasteway would take care of 6" rainfall over entire watershed in 24 hours, assuming all to reach the pond. If plank were not removed promptly however, there might and probably would be times during the 24 hours when water would rise faster than overflow at full capacity would draw it off. (This neglects equalizing effect of Brown's Pond and Spring Pond). Reported conditions to Mr. Emerson, Dec. 14, 1923 and he promises to have excavation filled in.

1923 Report to Co. Comm. The dam at the Pumping Station at Tapley's Brook is an earth dam behind a masonry wall with slope paving on the water side. It is in good condition and the wasteway which is closed by stop plank is sufficient to take care of any flood conditions which may reasonably be expected, in case all the stop plank be removed in time. As they are now installed, the water at full pond level will be within less than one foot of the top of the dam and in the cemetery to the east an excavation has been made which forms a low point over which the water might escape before reaching the top of the dam. This has been reported to the City Engineer who will have this excavation backfilled. I believe this dam should be raised.

1928, July 26. C. C. Barker, Insp. Dam at Fountain Pond (or the Basin) on Tapley Brook at the pumping station, is owned by the Peabody Water Works and is part of the water supply system. I gave a notice to Mr. Mosher, City Engineer, who had Mr. O'Donnell, inspector, accompany me to the dam. Mr. Mosher understands that you may want to inspect this dam yourself later. There is a wide open valley below the dam, in case of failure the only damage would be to their own property and possibly the cemetery which is near the dam. I think there would be no loss of life. There have been no changes since the last inspection and the conditions are the same. The dam is in good condition. The water level today is three feet below the top board at the spillway. This board is seven inches below the top of the dam. In the cemetery at the east end of the dam some earth has been dugged in where it was dug out, but more earth should be put back to prevent possible wash in case of extreme high water.

Peabody D. 10

1928, Nov. 22. R. R. Evans, Insp. notes on Dams in Peabody which see.

1928 Report to Co. Comm. At Fountain Pond immediately below Spring Pond, there is a dam of earth behind an apparently substantial masonry wall which should in an emergency withstand a considerable overflow for the entire length of the dam, although not designed for that. Probably in such case there would be some damage in the cemetery to the east from the water finding its way across the road east of the dam. There is a spillway in this dam and its capacity with all stop plank removed would probably be sufficient in any except the most exceptional storms. It would be advantageous to raise the dam somewhat if the water is regularly to be carried at the present level, and I so recommended in a previous report, but I cannot from present information say that it is absolutely necessary under present conditions. Much depends at present on the prompt removal of all stop plank when necessary, and I am informed by the City Engineer that this is closely supervised.

1930, Sept. 11. C. C. Barker, Insp. Dam at Fountain Pond (or the Basin) on Tapley Brook at the pumping station, is owned by the Peabody Water Works and is part of the water supply system. I gave a notice to City Engineer Roger W. MacDonald. He did not think it necessary for anyone to inspect the dams with me, as there had been no changes. There is a wide open valley below the dam, and in case of failure the only damage would be to their own property and possibly the cemetery which is near the dam. Just west of the spillway the paving has fallen somewhat and when the pond is full, it might wash out in back of the paving. There are many bushes on the upper slope which should be cut. At the east end there is a pile of earth, probably used for a spoil bank. It should not be excavated below the top of the dam, which is sometimes the case. The dam is in good condition, except as noted, and there have been no changes since the last inspection. Water level 4.5 ± below top of dam.

1930, Nov. 20. R. R. Evans, Insp. Some danger of washout in cemetery not by failure.

1930 Report to Co. Comm. The dam at Fountain Pond immediately below Spring Pond on Tapley Brook at the pumping station is also a part of the Peabody water supply system and is so situated that, except for the effect on the dams below, failure would do no great amount of damage. Safety depends on prompt removal of stop plank, and the spillway might well be larger and the dam higher for the present water level. The structure is apparently in good condition.

1932, July 28. C. C. Barker, Insp. I saw Roger W. MacDonald, City Engineer, who told me there was a nest of muskrats in the pond on the upper slope of this dam. There is evidence of this by spots of bright sand west of the spillway just under the water. Mr. MacDonald is trying to get rid of them. The condition of the dam is the same. Material of any kind is being dumped at east end on lower side of dam in cemetery. The water level is about 4 feet below the top of the dam.

Peabody D. 10

1933, See Report to Co. Comm.

1934, Sept. 26. C. C. Barker, Insp. I left a copy of the notice for Mr. MacDonald, City Engineer. No one inspected the dam with me. The dam is in good condition, however there are some bushes on the dam that should be cut. All kinds of rubbish and material is being dumped on the lower side of the dam on the easterly end. The water level is about 4 feet below the top. A 24 " Akron pipe has been laid from Spring Pond and empties at the west end of the dam on the lower side. This pipe takes water only from Brown Pond.

1934 Report to Co. Comm. See D. 5

1936 August 5, C.C.Barker, Insp. I gave a copy of the notice to Charles A. Mogavero, Comm. of Pub. Works, Edward Quirk of Water Dept. sent Joseph Pullea to the dam with me. Water level is 3.8 feet below the top. There are many bushes on the upper side. On the lower side the woods have been cut, but there are quite a few bushes and still some rubbish is being dumped on the lower side of the dam. The dam is in good condition except as noted and there has been no change.

1936 Report to Co. Comm. See D. 5

1938 October 19, C.C.Barker, Insp. I gave a copy of the notice to Mr. McCarthy for Mr. Mogavero, Comm. of Public Works. There are some bushes on the upper slope and the paving on the upper side northwest of the outlet has slumped some. There is some rubbish in the outlet on the lower side, otherwise the dam is in good condition and there has been no change. The water level is 4.5 feet below the top of the dam.

1938 Report to Co. Comm. See D. 7A.

1940 Sept. 27, C.C.Barker, Insp. I gave a copy of the notice to Frank McCarthy for Mr. Mogavero, Comm. of Public Works. This dam is in fair condition. There are some slumps in the upstream paving same when last inspected. There are many bushes on the slopes that should be cut. The water level is 4.5 feet below the top of the dam.

1940 Report to Co. Comm. See D. 7A.

1942 July 23, C.C.Barker, Insp. I gave a copy of the notice to Frank McCarthy, Comm. of Public Works. No one went to the dam with me. This dam is in fair condition. The slumps in the paving on the upper slope westerly of the outlet are about the same. There are many bushes on the slopes of the dam. No work has been done on the dam since the last inspection. The water level is about 6 feet below the top of the dam.

1942 Report to Co. Comm. See D. 7A.

1944 July 5, S. W. Woodbury, Insp. I left a copy of the notice for Mr. McCarthy, Com. of Public Works. I visited the dam alone. The water level is about 4 ft. below the top of the dam. Bushes have grown on each side of the dam so that it cannot be seen plainly. The timber work which holds the gate looks to be in bad shape. The slumps in the paving just west of the gate on the upper side do not appear to be bad.

Peabody D. 10

1944 Report to Co. Comm. Safe and in reasonably good condition.

1946 Aug. 2, S.W. Woodbury, Insp. I gave a copy of the notice to Mr. Thomas Harte for Mr. Frank McCarthy, Comm. of P.W. Mr. Harte went to the dam with me. Water level today is 3.5' below monel plug in top of wall at spillway. Condition of the dam is the same.

1946 Report to Co. Comm. Safe and in reasonably good condition.

1948 Sept. 15, S. W. Woodbury, Insp. Gave a copy of the notice to Mr. Thomas Harte for Mr. McCarthy and went to dam alone. Water level today: 4.4' below monel plug in top of wall at spillway. Condition of the dam is the same.

1948 Report to Co. Comm. Safe and in reasonably good condition.

1950 Sept. 18, S.W. Woodbury, Insp. Gave a copy of the notice to Mr. John Manning for Mr. McCarthy, Commissioner of Public Works, and went to dam alone. Water level today: 4.6' below monel plug in top of wall at spillway. Condition of the dam: Same.

1950 Report to Co. Comm. Safe and in reasonably good condition.

1952 Sept. 30, E.H. Page, Insp. Left a copy of the notice at the office of Com. of Public Works and went to dam with Mr. Driscoll from pumping station. No repairs since last inspection. Water level today: 4.2 below monel metal plug at spillway. Condition of the dam is the same.

1952 Report to Co. Comm. Safe and in reasonably good condition.

1954, June 2, E.H. Page, Insp. Elev. of water: 4" below flashboards. Height of flashboards: 3 ft. + . Minimum freeboard: 0". Debris downstream. Some erosion of banks on downstream slope.

1954 Report to Co. Comm. Safe and in reasonably good condition.

1956 Sept. 7, E.H. Page, Insp. Conditions: wet below dam. Elev. of water: 20" below top of flashboards. Height of flashboards: 4' + Debris downstream. Slope paving has settled.

1956 Report to Co. Comm. At the dam on Tapley Brook, near the pumping station and Fountain Road, the slope paving has settled a lot in places.

1959, Jan. 5, E.H. Page & K.M. Jackson, Insp. Condition: Same. Bushes have been cut down on dam.

1958 Report to Co. Comm. At the dam on Tapley Brook, near the pumping station at the end of Fountain Road, the slope paving has settled a lot in places. The bushes have been cut down on the upstream side of the dam.

Peabody D. 10

D 10. Sh. 5.

1961, January 5, E.H. Page and P.D. Killam, Insps. Height of flashboards: 2' above water. 2.5' below top dam. Condition: Same.

1960 Report to Co. Comm. At the dam on Tapley Brook, near the pumping station at the end of Fountain Road, the slope paving has settled in many places.

1962 Dec. 28, K.M. Jackson, Insp. No repairs. Conditions below dam: Full of debris. Elev. of water: 2'-3" below flashboards. Height of flashboards: 2'-3" Obstructions: two logs. Condition: Same as last report. Many heavy bushes growing out of slope.

1962 Report to Co. Comm. At the dam on Tapley Brook, near the pumping station, the slope paving has settled in several places. There are several heavy bushes growing out of slope paving that should be removed before they heave the slope paving out of place.

P.D.K. & K.M.J. Insps.

1964 March 9, 1965. A Condition same as in 1962. Many heavy bushes growing out of slope.

1964 Report to Co. Comm. The slope paving has settled in several places. There are several heavy bushes growing out of slope paving that should be removed before they heave the slope paving out of place. The outlet is full of gravel and debris.

1966 March 10, 1967. P.D.K. & K.M.J. Insps. Cutting of brush and small trees on earth embankment should be continued.

1966 Report to Co. Comm. Brush and small trees on both sides of earth embankment should be cut again.

1968 Tapley Brook at Pumping Station. Feb. 6, 1969. P.D. Killam. The water was not going over the spillway. Brush on the upstream face has been chopped down. This program should be continued.

D. 10 —

PEABODY

5-5-229-10

W. E. WILKINSON

11/29/71

2

ON TAPLEY BROOK, BEGIN ON LYNN ST. AT CEDAR GROVE AVENUE. TAKE CEDAR GROVE AVENUE SOUTHEASTERLY 0.30 MI. TO FIRST ROAD IN CEMETARY. ON THE RIGHT. TAKE THIS ROAD SOUTHERLY 0.20 MI TO DAM.

CITY OF PEABODY

WATER SUPPLY

EARTH WITH GRANITE MASONRY WALL ON LOWER SIDE
PAVED WITH LARGE FLAT STONES ON WATER SIDE. GRANITE SPILLWAY
15.0± FEET

200.0± FT.

15± FT.

10.4 ACRES

26,000,000

1.6±

WATER LEVEL OF POND 18 INCHES
BELOW TOP OF FLASH BOARDS TO-DAY OR 5.0± FEET BELOW
TOP OF DAM.

APPENDIX C
PHOTOGRAPHS

(For location and direction of view of photographs, see Figure B-1 in Appendix B).

FOUNTAIN POND DAM



NO. 1 VIEW OF DAM AND PUMPING STATION



NO. 2 UPSTREAM VIEW OF SPILLWAY AND STOPLOGS



NO. 3 VIEW OF SPILLWAY



NO. 4 BRUSH GROWING ON RIPRAP ON UPSTREAM SLOPE

FOUNTAIN POND DAM



NO. 5 RIPRAP ON UPSTREAM SLOPE



NO. 6 DOWNSTREAM VIEW OF SPILLWAY

FOUNTAIN POND DAM



NO. 7 DOWNSTREAM SLOPE OF DAM



NO. 8 DOWNSTREAM DISCHARGE AREA

APPENDIX D
HYDROLOGIC AND HYDRAULIC
COMPUTATIONS

FOUNTAIN POND DAM

I General

Fountain Pond Dam has a size classification of LOW and has been assigned a hazard potential of SIGNIFICANT due to possible loss of a few lives under failure. The applicable test flood ranges from the 100yr storm ($\pm \frac{1}{4}$ PMF) to the $\frac{1}{2}$ PMF.

Spring Pond & Brown's Pond control the bulk of the drainage area supplying Fountain Pond. Phase I Insp. Reports are available for both Spring Pond and Brown's Pond. Discharge data is thus available for the $\frac{1}{2}$ and $\frac{1}{4}$ PMF from Spring Pond and for the $\frac{1}{4}$ PMF from Brown's Pond.

Facilitated by this data, flood flows thru Fountain Pond have been determined for a Low Test Flood ($\frac{1}{4}$ PMF) and a High Test Flood ($\frac{1}{2}$ PMF).

The precipitation vs time data in the Spring Pond Phase I report was used to develop direct inflow to Fountain Pond. A $\frac{1}{2}$ PMF routing thru Brown's Pond was developed. The discharges from Brown's and Spring Ponds were added to the direct inflow to Fountain on a common time basis for both the $\frac{1}{4}$ and $\frac{1}{2}$ PMF cases. A deduction of 16 cfs was made to all flows to account for discharge thru the Lynn St. drain and the 24 in. drain which by passes Fountain Pond. The resulting total inflows were routed thru Fountain Pond.

Both test floods were routed thru Fountain Pond with flash boards in and flash boards out.

II Discharge Ratings

A. Spillway - w/ Stoplogs to El. 68.3

Stoplogs - 4' wide, Use Williams & Hazen - "Hydr. Tables", $p=30$

Pond El.	69	69.5	70.0	70.5	71.0	71.5	72.0	72.5	73.0
Q_A	10	20	30	40	60	80	90	110	130

B. Spillway - no stoplogs, Crest El. 65.5

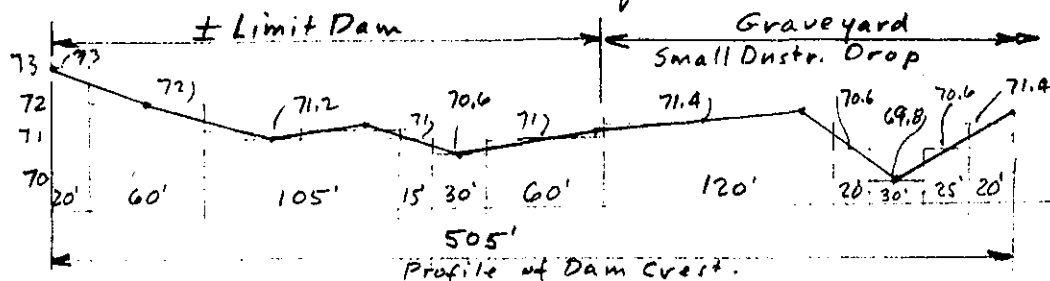
Use broad crest rel. ; $q = 2.55 H^{1.5}$ [Ref.: V.T. Chow, pg 52-53]

$$\therefore Q_B = 4(2.55) H^{1.5} = 10.2 H^{1.5}$$

Pond El.	67	67.3	68.3	69	69.5	70.0	70.5	71.0	71.5	72.0
Q_B	18.7	24.6	47.8	70	80	100	110	130	150	170

C. Crest Flow

Use broad crest weir rel. ; $q = 2.55 H^{1.5}$



30'@El. 69.8, 75'@El. 70.6, 75'@El. 71.0, 105'@El. 71.2, 140'@El. 71.4, 60'@El. 72

Pond El.	70.0	70.5	71.0	71.5	72.0	72.5	73.0
Q_1	10	40	100	130	250	340	440
Q_2	—	—	50	160	320	500	710
Q_3	—	—	—	70	190	350	540
Q_4	—	—	—	40	190	400	650
Q_5	—	—	—	10	170	410	720
Q_6	—	—	—	—	—	50	150
ΣQ_6	10	40	150	410	1120	2050	3210

III Storage

Data based on 1932-33 map of Fountain and adjacent ponds

Pond Elev.	Area (acres)	Volume (acre ft.) Incrv.	Total w/out S.L.	Total w/S.L.
65.5	15		0	0
		44.7		
68.3	16.9		44.7	0
		37.1		
70.4	18.4		81.8	37.1
		33.9		
72	24		115.7	71.0
		69.0		
74	45		184.7	140.0

IV Discharge Around Dam

When Fountain Pond rises above el. 71.2 ±, flooding west of dam will include some discharge down streets towards Sidney Pond. Flow width is about 1000 ft, less 40% for houses, etc. Slope is about 10' in 1000 ft. Manning "n" is assumed to be about 0.10.

$$\therefore V_s = \frac{1.49}{n} R^{2/3} S^{1/2} = 1.49 R^{2/3} ; \text{ let } R \approx y \cdot \text{flow depth}$$

Pond El.	y	Vel.	Area	$Q_s + Q_c + Q_A^* \approx \text{Tot. } Q^*$
72	.8	1.28	480	600 1120 90 1800
72.5	1.3	1.77	780	1400 2650 110 3600
73	1.8	2.20	2380	5200 3210 130 8500

* Tot. shown is for "with stoplogs". Removal of stoplogs would increase ditch. less than probable error in above analysis, and would have a minor storage benefit due to small pond size. Results of 1/2 PMF analysis should be considered same for conditions "with stoplogs" as for condition "without stoplogs".

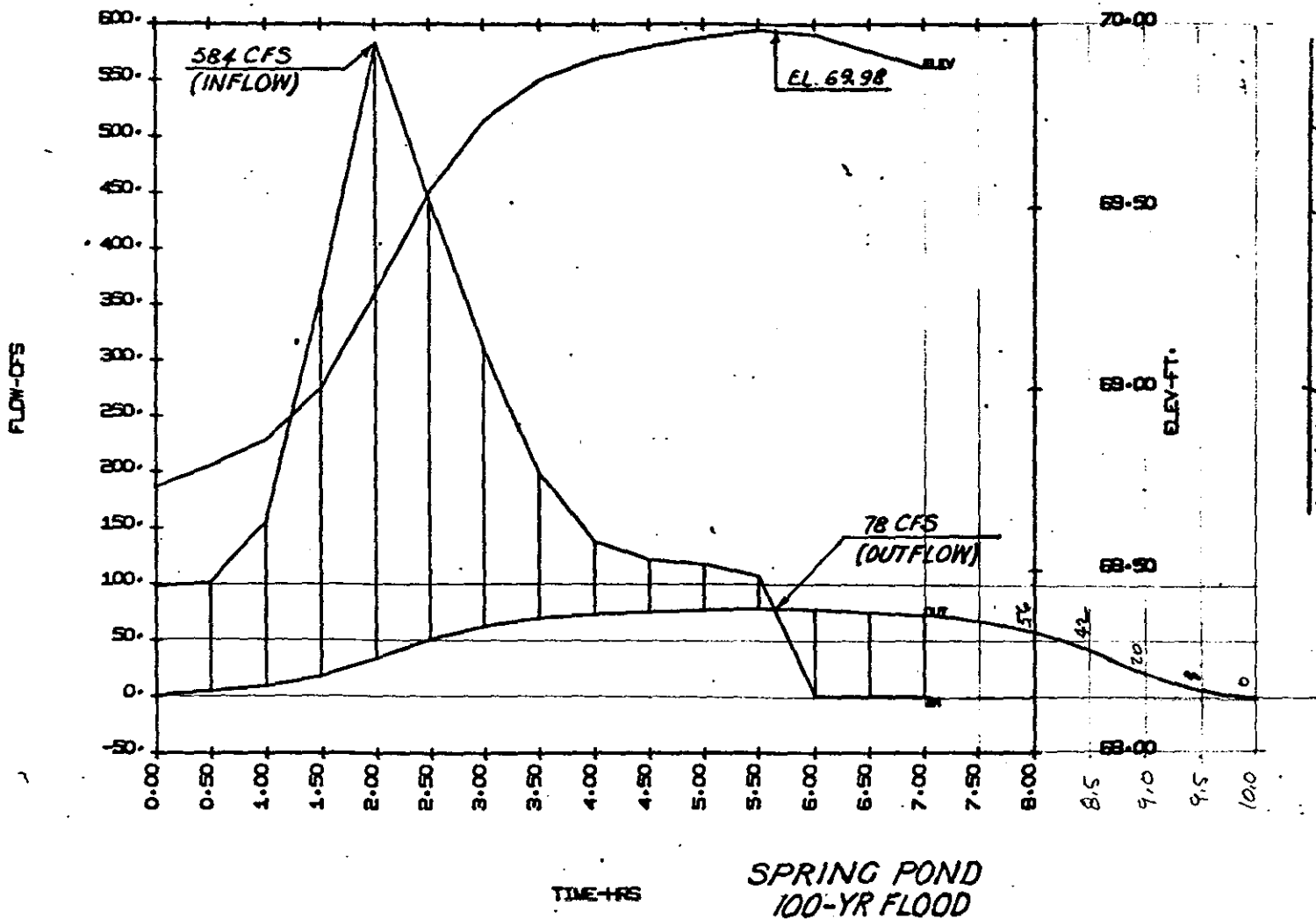
IV

Data from Phase I Study

A. Spring Rd - 100 yr Flood

16

Sh. 4 of 16



D-4

FOUNTAIN POND DAM

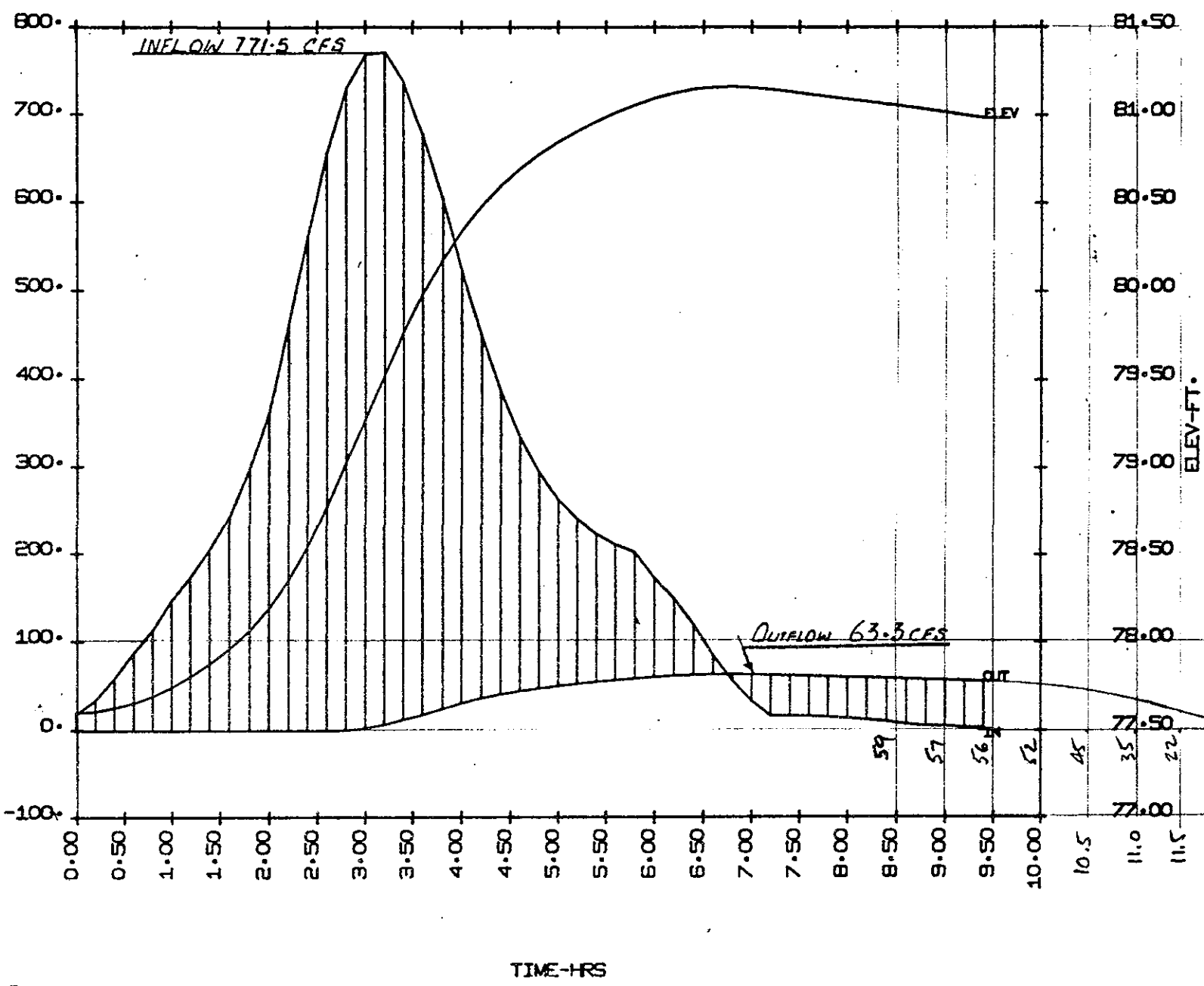
IV

Data from Phase I Study

B - Brown's Pond - 100 yr Flood

54.5 of 16

8 of 9



S.F.D.-WOLF
D-5

FOUNTAIN POND DAM

VI Fountain Pond - Direct Inflow - "100 yr. freq." storm ($\pm 1/4$ PMP)

Direct Inflow - total trib area = 222 acres

Time Ending	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
1/4 PMP Incr. in rain	0.27	0.29	0.31	0.33	0.51	0.51	0.70	1.07	1.38	1.85
1/4 PMP " " "	0.067	0.072	0.077	0.082	0.127	0.127	0.175	0.267	0.345	0.462
R.O. Incr. inches	0.042	0.047	0.052	0.057	0.102	0.102	0.150	0.242	0.320	0.437
Direct Inflow (cfs)	37	42	46	51	91	91	133	215	284	388

Time Ending	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00
Full Incr. in rain	1.76	1.52	1.23	1.02	0.78	0.63	0.54	0.48	0.43	0.390
1/4 " " "	0.440	0.390	0.307	0.255	0.195	0.157	0.135	0.120	0.107	0.100
R.O. " " "	0.415	0.255	0.282	0.230	0.170	0.132	0.110	0.095	0.082	0.075
Direct Infl. (cfs)	368	315	250	204	151	117	98	84	73	67

Time Ending	5.25	5.50	5.75	6.00	6.5	7.0	7.5	8.0	8.5
Full Incr. in rain	0.39	0.39	0.33	0.33	Values estimated by "eye"				
1/4 " " "	0.100	0.100	0.090	0.080					
R.O. " " "	0.075	0.075	0.055	0.055					
Direct Infl. (cfs)	67	67	49	49	30	20	10	5	0

VII Fountain Pond - Total Inflow - "100 yr. freq." storm

Direct Inflow (above) added to Brown & Spring Pond discharges taken from their Phase I Review - by others. Net inflow is total less est. flow in Lynn St & Bypass drains taken at 16 cfs. (20" & 24" @ 3 fps)

Time	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Spring Pd.	2	5	10	19	35	52	63	70	73	75	77	78
Brown Pd.	0	0	0	0	0	0	10	25	39	48	54	59
Dir. Infl.	42	51	91	215	388	315	204	117	84	67	67	49
Total	44	56	101	234	423	367	277	212	196	190	198	186
Net Inflow	28	40	85	218	407	351	261	196	180	174	182	170

Time	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0
Spring Pd.	77	75	72	56	42	20	8	-	-	-	-	-
Brown Pd.	62	63	62	61	59	57	56	52	45	35	22	12
Dir. Infl.	30	20	10	5	-	-	-	-	-	-	-	-
Total	169	158	144	122	101	77	64	52	45	35	22	12
Net Inflow	153	142	128	106	85	61	48	36	29	19	6	0

Low Test Flood - Res. Routing

Sheet 7 of 16

A.

M E T C A L F & E D D Y
R E S E R V O I R F L O O D R O U T I N G
6356 FOUNTAIN POND 100 PMF T F WITH STOPLOGS
ENGINEER: LANGILL

PAGE 4

DATE: 10-SEP-79

TIME: 15:04:01

TIME INCREMENT FOR PRINTED OUTPUT = 0.50
INITIAL RESERVOIR ELEV. = 68.30

T	EL	Q IN	Q OUT	STRG
0.00	68.30	0.00	6.00	0.0
0.50	68.34	28.00	6.78	0.7
1.00	68.40	40.00	8.03	1.8
1.50	68.53	85.00	10.53	4.0
2.00	68.85	218.00	16.99	9.7
2.50	69.53	407.00	30.53	21.7
3.00	70.31	351.00	65.05	35.6
3.50	70.73	261.00	139.79	44.1
4.00	70.86	196.00	174.06	46.9
4.50	70.88	180.00	184.33	47.7
5.00	70.89	174.00	181.31	47.5
5.50	70.90	182.00	189.78	48.2
6.00	70.90	170.00	184.10	47.7
6.50	70.86	153.00	174.83	46.9
7.00	70.82	142.00	163.78	46.0
7.50	70.78	128.00	152.10	45.1
8.00	70.72	106.00	137.77	43.9
8.50	70.66	85.00	120.61	42.5
9.00	70.58	61.00	101.27	41.0
9.50	70.51	48.00	82.44	39.4
10.00	70.41	0.00	72.49	37.2
5.60	70.92	179.58	188.91	48.1 PEAK

1) Low Test Flood - Res. Routing

Sh 8 of 16

M E T C A L F & E D D Y
R E S E R V O I R F L O O D R O U T I N G
6356 FOUNTAIN POND 100 PMF T F WOUT STOPLOGS
ENGINEER: BRANAGAN

PAGE 4

DATE: 10-SEP-79

TIME: 14:50:34

TIME INCREMENT FOR PRINTED OUTPUT = 0.50
INITIAL RESERVOIR ELEV. = 65.50

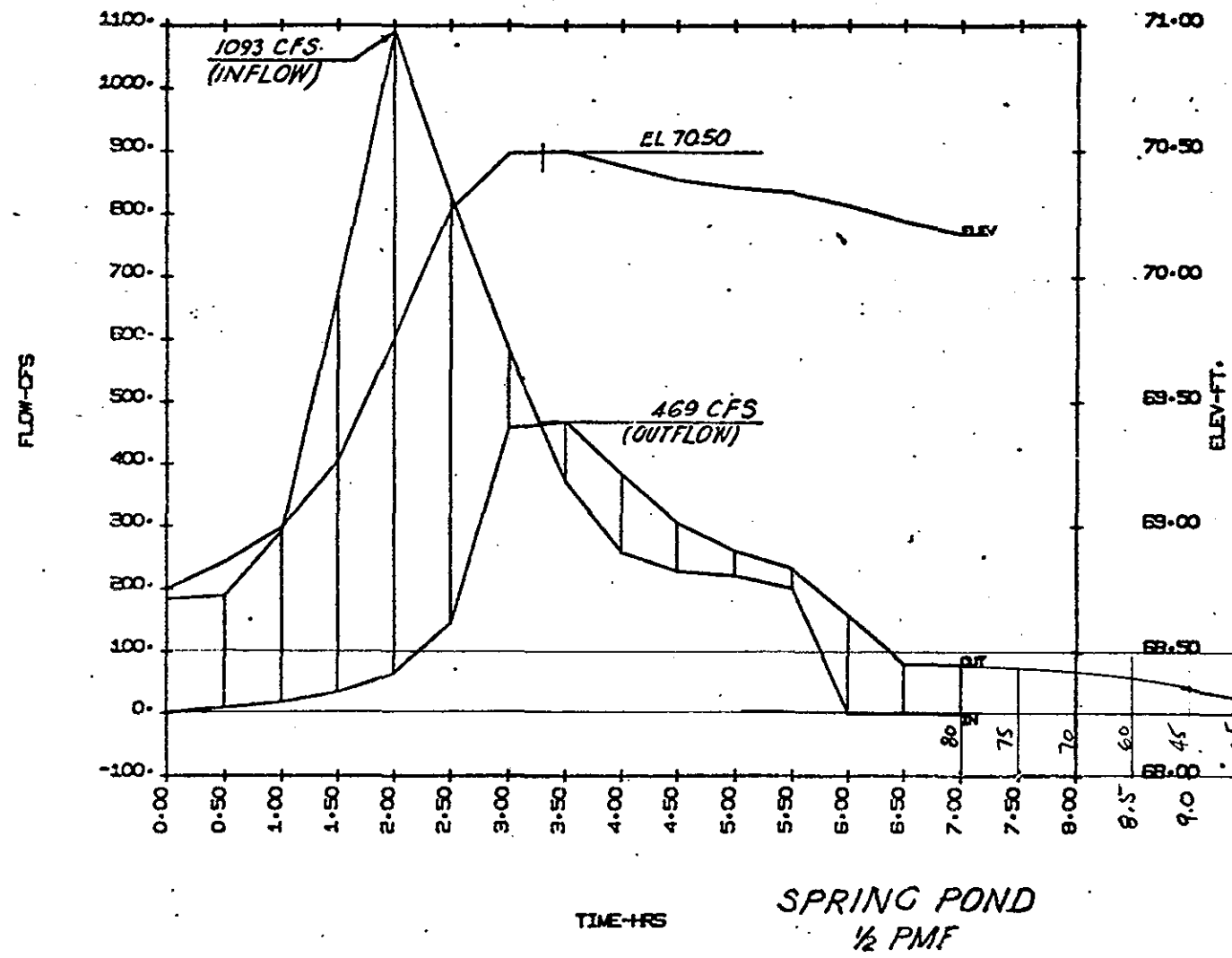
T	EL	Q IN	Q OUT	STRG
0.00	65.50	0.00	0.00	0.0
0.50	65.56	28.00	0.90	0.8
1.00	65.65	40.00	2.36	2.2
1.50	65.81	85.00	5.00	4.6
2.00	66.22	218.00	11.46	10.5
2.50	67.04	407.00	24.70	22.7
3.00	68.02	351.00	40.60	37.1
3.50	68.73	261.00	65.41	47.5
4.00	69.16	196.00	80.64	53.9
4.50	69.45	180.00	90.69	58.1
5.00	69.68	174.00	98.78	61.5
5.50	69.89	182.00	106.21	64.6
6.00	70.08	170.00	116.09	67.3
6.50	70.19	153.00	125.18	69.0
7.00	70.25	142.00	129.63	69.8
7.50	70.28	128.00	132.13	70.3
8.00	70.24	106.00	129.01	69.7
8.50	70.15	85.00	122.18	68.4
9.00	70.03	61.00	112.18	66.6
9.50	69.88	48.00	105.66	64.4
10.00	69.66	0.00	97.97	61.1
7.50	70.28	128.00	132.13	70.3 PEAK

18

Data from Phase I Study

Sh. 9 of 16

A-Spring Pond - 1/2 PMF



Data from
Brown's Pond - 100yr Flood Routing

	TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT.)	Time	* 1/2 PMF Inflow (±)
	0.00	0.00		0.0000	77.60	0.0	0
	0.20	18.57	0.00	0.1535	77.60		
	0.40	34.07	0.00	0.5887	77.61	0.5	92
	0.60	58.46	0.00	1.3535	77.63		
	0.80	87.73	0.00	2.5618	77.65		
	1.00	113.67	0.00	4.2263	77.69	1.0	227
	1.20	147.25	0.00	6.3927	77.74		
	1.40	173.47	0.00	9.0333	77.80	1.5	378
	1.60	204.60	0.00	12.1579	77.87		
	1.80	242.94	0.00	15.8567	77.96	2.0	596
	2.00	298.11	0.00	20.3282	78.06		
	2.20	361.72	0.00	25.7815	78.19	2.5	1024
	2.40	461.20	0.00	32.5826	78.34		
	2.60	562.41	0.00	41.0422	78.54		
	2.80	655.97	0.00	51.1116	78.77	3.0	1460
	3.00	729.97	0.35	62.5648	79.03		
	3.20	768.60	2.86	74.9231	79.27	3.5	1510
	3.40	771.51	7.03	87.5776	79.52		
	3.60	738.15	12.51	99.8927	79.76	4.0	1210
	3.80	678.05	17.60	111.3479	79.98		
	4.00	604.82	24.71	121.6012	80.17	4.5	836
	4.20	523.50	31.00	130.4657	80.34		
	4.40	450.03	36.31	137.9550	80.48	5.0	588
	4.60	385.64	40.76	144.2244	80.60		
	4.80	333.90	44.48	149.4666	80.69	5.5	464
	5.00	293.86	47.62	153.8937	80.78		
	5.20	262.59	50.31	157.6832	80.85	6.0	405
	5.40	240.08	52.65	160.9866	80.91		
	5.60	223.36	54.74	163.9291	80.96	6.5	269
	5.80	211.06	56.71	166.5986	81.01		
	6.00	202.53	58.69	169.0628	81.06	7.0	111
	6.20	172.53	60.38	171.1784	81.09		
	6.40	149.57	61.70	172.8314	81.12	7.5	33
	6.60	119.10	62.66	174.0240	81.15		
	6.80	84.24	63.17	174.6645	81.16	8.0	30
	7.00	55.60	63.26	174.7753	81.16		
	7.20	32.96	63.01	174.4636	81.15	8.5	20
	7.40	16.38	62.51	173.8340	81.14		
	7.60	16.20	61.90	173.0751	81.13	9.0	10
	7.80	16.00	61.30	172.3229	81.12		
	8.00	15.00	60.70	171.5708	81.10	9.5	0
	8.20	14.00	60.09	170.8122	81.09		
	8.40	12.00	59.47	170.0389	81.07		
	8.60	10.00	58.83	169.2430	81.06		
	8.80	7.00	58.17	168.4164	81.04		
	9.00	5.00	57.48	167.5597	81.03		
	9.20	5.00	56.79	166.6978	81.01		
	9.40	3.00	56.10	165.8309	81.00		
	9.60	3.00	55.47	164.9584	80.98		
	MAX. VALUES	771.51	63.26		81.16	* 1/2 PMF Inflow taken as 2x(100 yr. flood inflow)	
	MIN. VALUES	0.00	0.00		77.60		

D-10

FOUNTAIN POND DAM

IX

Data from Phase I Study
B. Brown's Pond - 1/2 PMF Inflow

54.10 of 16

8) Brown's Pond - 1/2 PMF Res. Routing

Sh. 11 of 16

M E T C A L F & E D D Y
R E S E R V O I R F L O O D R O U T I N G
6356 BROWNS POND 0.5 PMF T.F.
ENGINEER: BRANAGAN

PAGE 4

DATE: 07-SEP-79
TIME: 14:03:58

TIME INCREMENT FOR PRINTED OUTPUT = 0.50
INITIAL RESERVOIR ELEV. = 77.60

T	EL	Q IN	Q OUT	STRG
0.00	77.60	0.00	0.00	0.0
0.50	77.66	92.00	0.00	2.7
1.00	77.81	227.00	0.00	9.3
1.50	78.10	378.00	0.00	21.8
2.00	78.56	596.00	0.00	41.9
2.50	79.29	1024.00	2.87	75.4
3.00	80.26	1460.00	27.95	126.1
3.50	81.32	1510.00	72.49	185.3
4.00	82.27	1210.00	205.24	237.0
4.50	82.74	836.00	469.38	264.5
5.00	82.87	588.00	546.32	272.5
5.50	82.87	464.00	547.19	272.6
6.00	82.81	405.00	509.64	268.7
6.50	82.71	269.00	451.65	262.7
7.00	82.55	111.00	364.25	253.6
7.50	82.38	33.00	267.66	243.5
8.00	82.24	30.00	190.23	235.5
8.50	82.15	22.00	136.32	229.8
9.00	82.08	10.00	107.91	225.8
9.50	82.00	0.00	104.26	221.6
5.30	82.89	512.85	557.22	273.7 PEAK

FOUNTAIN POND DAM

Project Nat. Review of NonFed. Dams Acct. No. 6356 Page 12 of 16
 Subject Essex County, Mass. Comptd. By LEB Date 7/31/79
 Detail FOUNTAIN POND Ck'd. By WC Date 8/15/79

(XI) Fountain Pond - Total Inflow - 1/2 PMF

Time	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Spring Pd.	3	10	18	35	65	147	459	469	383	305	260	232
Brown Pd.	0	0	0	0	3	28	72	205	469	546	547	510
Direct Infl.	84	102	152	430	776	630	408	234	168	134	134	98
Total	87	112	200	465	844	805	939	908	1020	985	941	840
Net Inflow	71	96	184	449	828	789	923	892	1004	969	925	824

Time	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0
Spring Pd.	159	80	75	70	60	45	25	10	5	-	-	-
Brown Pd.	452	364	268	190	136	108	104	-	-	-	-	-
Direct Inflow	60	40	20	10	-	-	-	-	-	-	-	-
Total	671	484	363	270	196	153	129	10	5	-	-	-
Net Inflow	655	468	347	254	180	137	113	-	-	-	-	-

(VII) Time to Lower Pond

Assume pond starts at el. 68.3 and all flash boards are removed. Initial disch. = 47.8 cfs (see item (II) B), and disch. at pond el. 67.3 = 24.6 cfs. Say, ave. discharge is 36.2 cfs.

$$\text{Time to Lower Pond 1 foot} = \frac{16.9 (43560)}{36.2 (3600)} = \underline{5.6 \text{ hours or } 339 \text{ min.}}$$

III 1/2 PMF Test Flood - Res. Routing

Sh. 13 of 16

1 -

M E T C A L F & E D D Y
R E S E R V O I R F L O O D R O U T I N G
6356 FCUNTAIN POND 0.5 PMF T F WITH STOPLOGS
ENGINEER: LANGILL

PAGE 4

DATE: 11-SEP-79
TIME: 11:11:56

TIME INCREMENT FOR PRINTED OUTPUT = 0.50
INITIAL RESERVOIR ELEV. = 68.30

T	EL	Q IN	Q OUT	STRG
0.00	68.30	0.00	0.00	0.0
0.50	68.38	71.00	1.92	1.4
1.00	68.57	96.00	6.29	4.7
1.50	68.87	184.00	13.48	10.1
2.00	69.57	449.00	29.77	22.4
2.50	70.79	828.00	174.48	45.4
3.00	71.60	789.00	656.67	62.6
3.50	71.74	923.00	877.19	65.5
4.00	71.76	892.00	908.39	65.9
4.50	71.80	1004.00	973.09	66.7
5.00	71.81	969.00	987.88	66.9
5.50	71.78	925.00	939.11	66.3
6.00	71.73	824.00	855.28	65.2
6.50	71.63	655.00	707.63	63.3
7.00	71.52	468.00	526.93	60.9
7.50	71.40	347.00	431.26	58.2
8.00	71.23	254.00	338.84	54.7
8.50	71.08	190.00	253.46	51.5
9.00	70.96	137.00	202.52	48.9
9.50	70.83	113.00	180.46	46.1
10.00	70.62	0.00	144.62	41.7
4.90	71.82	975.72	1001.39	67.1 PEAK

III

1/2 PMF Test Flood - Res. Routing

Sh 14 of 16

B-

METCALF & EDDY
RESERVOIR FLOOD ROUTING
6356 FOUNTAIN POND 0.5 PMF T F WOUT STOPLOGS
ENGINEER: BRANAGAN

PAGE 4

DATE: 10-SEP-79
TIME: 14:43:07

TIME INCREMENT FOR PRINTED OUTPUT = 0.50
INITIAL RESERVOIR ELEV. = 65.50

T	EL	Q IN	Q OUT	STRG
0.00	65.50	0.00	0.00	0.0
0.50	65.60	71.00	1.57	1.4
1.00	65.82	96.00	5.17	4.8
1.50	66.19	184.00	11.10	10.2
2.00	67.03	449.00	24.55	22.6
2.50	68.72	828.00	65.22	47.4
3.00	70.68	789.00	197.86	76.3
3.50	71.67	923.00	846.58	90.8
4.00	71.71	892.00	902.67	91.3
4.50	71.76	1004.00	980.56	92.0
5.00	71.75	969.00	978.06	92.0
5.50	71.73	925.00	934.54	91.6
6.00	71.67	824.00	845.82	90.8
6.50	71.58	655.00	691.55	89.4
7.00	71.46	468.00	535.73	87.6
7.50	71.25	347.00	421.99	84.6
8.00	71.06	254.00	316.32	81.9
8.50	70.89	180.00	251.68	79.3
9.00	70.70	137.00	202.01	76.5
9.50	70.54	113.00	161.30	74.2
10.00	70.29	0.00	133.40	70.5
4.80	71.77	982.79	1000.79	92.2 PEAK

(XIV) Crest Flow Conditions - For Low Test Flood = $\frac{1}{4}$ PMF

Note: High water level with stoplogs in, for all cases

A - Over Low Pt. @ Graveyard - El. 69.8

$$\text{Max. Depth} = 70.9 - 69.8 = 1.1 \text{ ft}$$

$$q = 2.55 (1.1)^{1.5} = 2.9 \text{ cfs/ft.}$$

$$\text{Crit. depth} = y_c = 0.64 \text{ ft., Crit. Vel} = V_c = 4.6 \text{ fps}$$

B - Over Low Pt. on Dam - El. 70.6

$$\text{Max Depth} = 70.9 - 70.6 = 0.3 \text{ ft.}$$

$$q = 2.55 (0.3)^{1.5} = 0.42 \text{ cfs/ft.}$$

$$y_c = 0.18 \text{ ft., } V_c = 2.4 \text{ fps}$$

(XV) Crest Flow Conditions - For High Test Flood = $\frac{1}{2}$ PMF

A - Over Low Pt. @ Graveyard - El. 69.8

$$\text{Max Depth} = 71.8 - 69.8 = 2.0 \text{ ft.}$$

$$q = 2.55 (2.0)^{1.5} = 7.21 \text{ cfs/ft.}$$

$$y_c = 1.17 \text{ ft., } V_c = 6.14 \text{ fps}$$

B - Over Low Pt. on Dam - El. 70.6

$$\text{Max Depth} = 71.8 - 70.6 = 1.2 \text{ ft.}$$

$$q = 2.55 (1.2)^{1.5} = 3.35 \text{ cfs/ft.}$$

$$y_c = 0.70 \text{ ft., } V_c = 4.76 \text{ fps.}$$

Note: "Time to Lower Pond" shown on Sheet 12

(XVI) Failure of Dam (Stoplogs in)

Peak Failure Flow:

Pond Elevation - 69.8 (L.R. Crest - in cemetery)

Toe Elevation - 60.2

$$Y_0 = 9.6 \text{ ft.}$$

Dam Length Subject to Breaching = 150' (North of Spill.)

$$W_0 = 40\% (150) = 60 \text{ ft.}$$

$$Q_P = 1.68 W_0 (Y_0)^{1.5} = 1.68 (60) (9.6)^{1.5} \approx \underline{3000 \text{ cfs.}}$$

Ongoing discharge = 30 cfs. - Ignore

Storage Volume Released:

Storage Above Spillway $14.7 \times 2.3 = 34$ acre feet

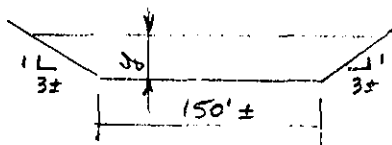
Storage Below Spillway $14.7 \times 1.6 = 24$ " " (up to rd.)

$S = \text{Total Storage} = \underline{58 \text{ acre feet}}$

Channel Hydraulics:

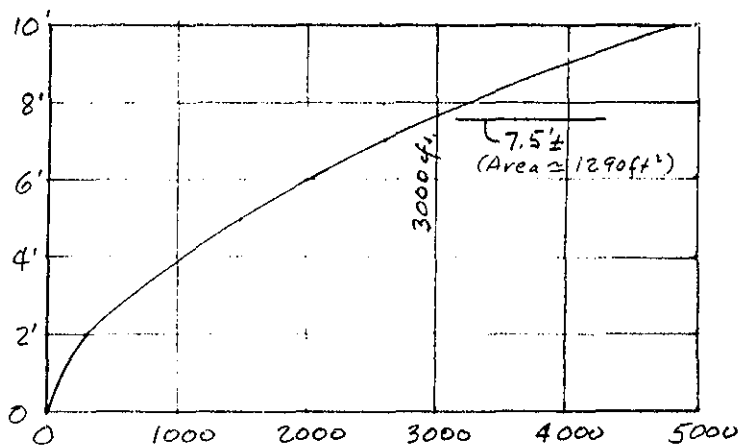
$$S = \frac{Q^2}{680} = .0009, n = .07, V = 0.64 R^{2/3}$$

$$A = 150y + 3y^2; P \approx 150 + 6y = B$$



y	A	$R^{2/3}$	V	Q
2	312	1.54	1.0	310
5	825	2.75	1.8	1460
7	1197	3.39	2.2	2590
10	1800	4.19	2.7	4820

Flow would be about 4 to 5 feet above the foundation of one downstr. house on Cemetery Rd.



Time to Drain:

$$\frac{43560 (58)}{3600 (1/2) (3000)} = 0.47 \text{ Hours} = 28 \text{ Min.}$$

APPENDIX E
INFORMATION AS CONTAINED
IN THE
NATIONAL INVENTORY OF
DAMS

FOUNTAIN POND DAM